Gas Journal

VOL. 295. 110th YEAR. LONDON, SEPTEMBER 17, 1958 No 4966 PRICE 1/6

4-LIFT SPIRALLY-GUIDED GASHOLDER, CAPACITY 5,000,000 CUBIC FEET, IN STEEL TANK RECENTLY COMPLETED AT NEEPSEND GASWORKS, SHEFFIELD, FOR THE EAST MIDLANDS GAS BOARD.

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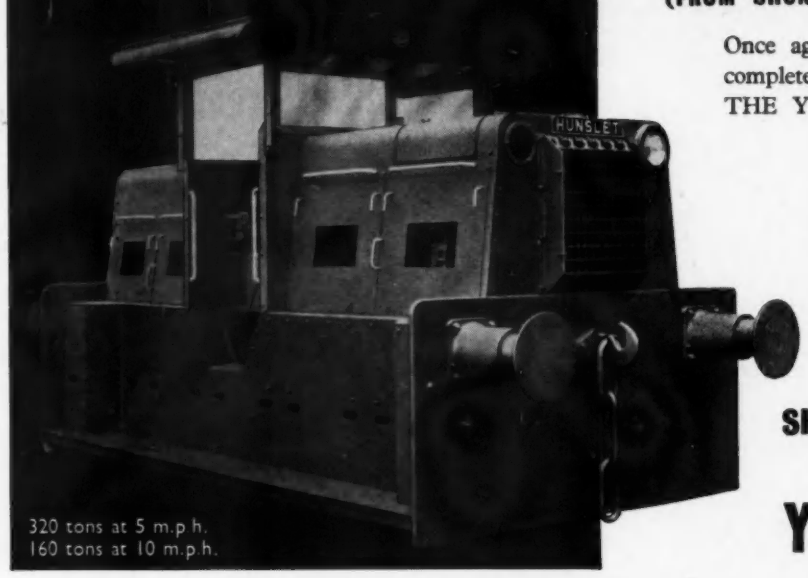
The YARDMASTER



320 tons at 5 m.p.h.
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that a child can drive

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Once again "Hunslet" lead with a completely new approach—
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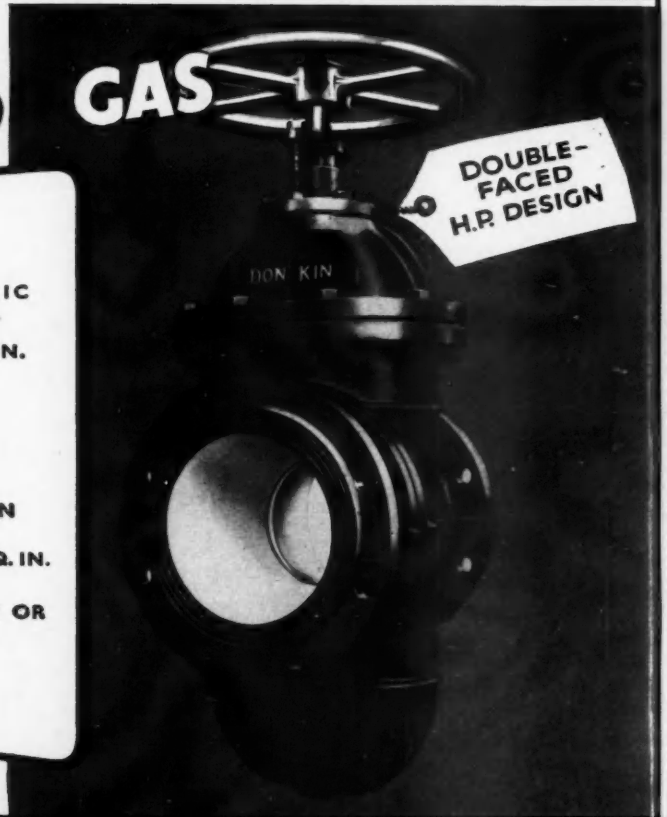
H64

THE "CL" VALVE FO GAS



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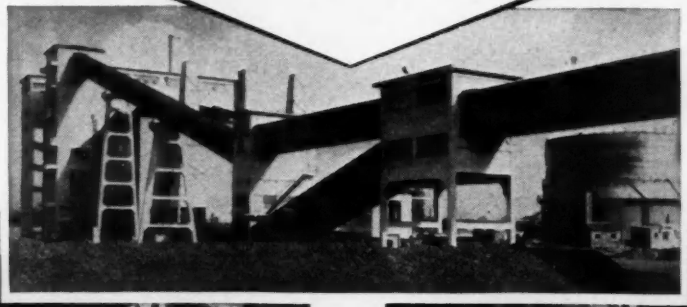
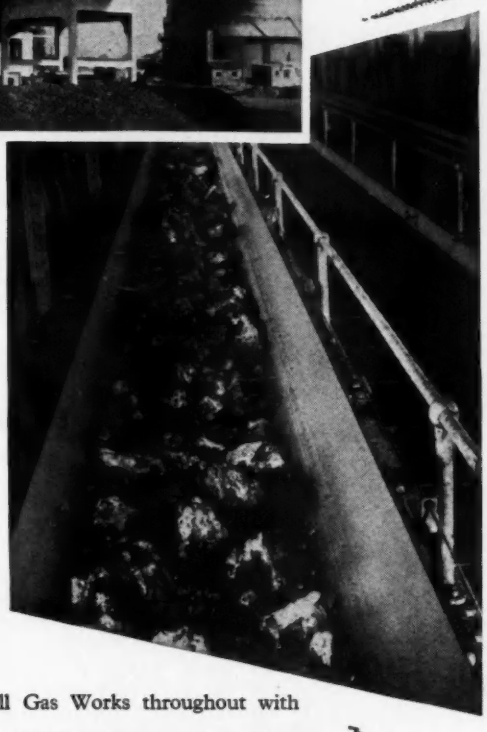
Another GAS WORKS equipped throughout with BTR CONVEYOR BELTING





They equipped Preston's Lostock Hall Gas Works throughout with BTR Belting . . .

This is the way to buy belting—call in BTR engineers, rely on BTR know-how, let BTR specify the belt-for-the-job no matter what your particular problems and conditions . . . for main, shuttle and inclined conveyors. Consult them before you start a project—there's a BTR belt, for example, that can save you space and structures by carrying coal or coke *without load slip*. And for carrying the discharge away from the retorts, BTR engineers can select from a wide range of BTR hot materials belts just the right one for your conditions and temperatures.

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B·O·L

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FOR SHELL CHEMICAL COMPANY AT SHELLHAVEN

The British Oxygen Linde plant is in course of erection for the production of tonnage oxygen and nitrogen for the manufacture of ammonia.

SHELL

FOR SHELL CHEMICAL COMPANY AT PARTINGTON, NEAR MANCHESTER

Work on this plant for the direct oxidation of ethylene will shortly be completed.

FOR THE IRON AND STEEL WORKS AT DURGAPUR

In India. An order has recently been placed with British Oxygen Linde to supply 2 Tonnage Oxygen units with a total capacity of 100 tons a day.

FOR THE IRON AND STEEL WORKS AT ROURKELA

In India. 3 British Oxygen Linde units have been ordered, each with a capacity of 100 tons of oxygen a day.

AE&CI

FOR AFRICAN EXPLOSIVES AND CHEMICAL INDUSTRIES LIMITED

at Modderfontein. British Oxygen Linde plant has been ordered with a daily output of 275 tons of oxygen and 285 tons of nitrogen for the manufacture of ammonia.

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For repairing reinforced concrete it has particular merit, as, due to the method of application, a uniform density and adherence is obtained whenever Gunite is applied.

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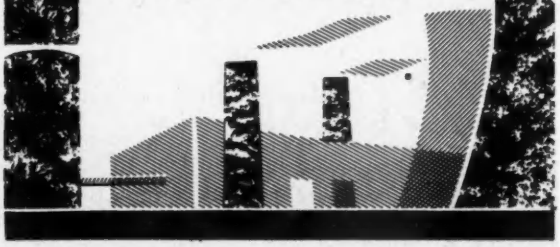

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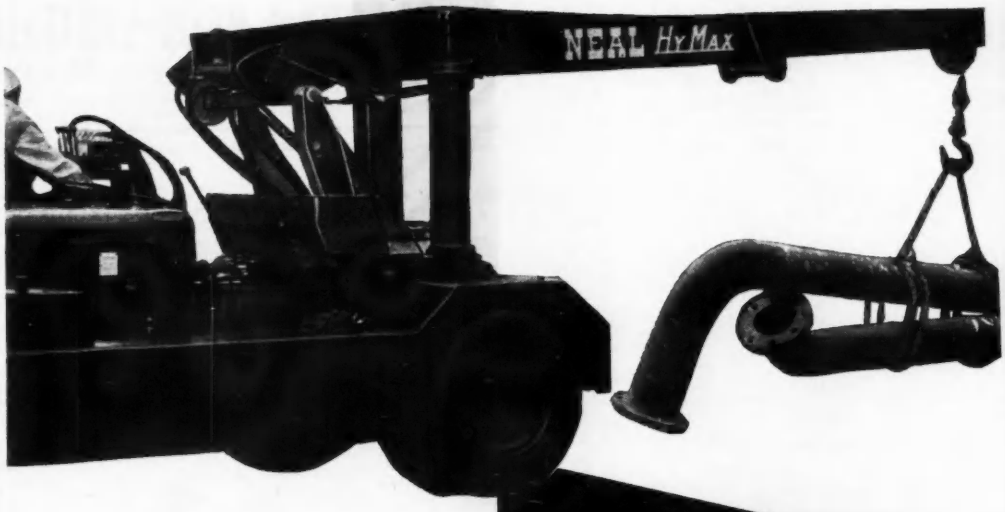
the only crane

that can carry *Maximum Load*
of **10,000 lbs** at 8 ft outreach
with Jib horizontal under **8 ft** headroom

The all hydraulic **Hy-Max**



features ●

- Fitted with special hydraulically operated telescopic jib, not just a telescopic hook
- Road speed of 12 mph enabling it to cover distances quickly
- 4 speeds both forward and reverse
- Power operated steering for exceptional manoeuvrability
- A multi-purpose crane of high quality, design and performance

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- ★ Capacities from 250 to 20,000 gallons per hour.
- ★ Compact design requiring minimum of floor space.
- ★ Wide range of speeds to suit viscosities of liquids.
- ★ High efficiency over a wide range of heads.
- ★ Pump end and fittings can be supplied in materials to suit liquids; special provision for handling abrasives.
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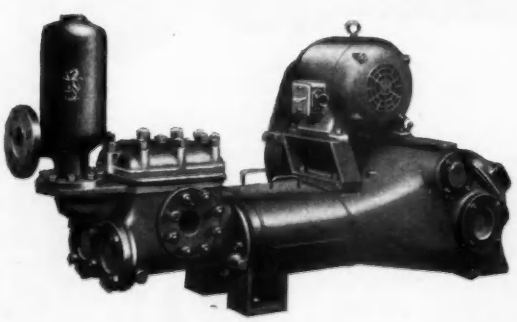
- ★ Jacket barrels can be provided for liquids liable to solidify.
- ★ Drive from motor or engine by gears, V ropes, worm reduction gear unit or chain.

The Joseph Evans' horizontal, totally enclosed Duplex self-oiling pump, designed to conform to the highest requirements and specifications.



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Giants of the West

Sinister rumours cloud the memory of the giant of Trebiggan. But with those enormous arms of his — and the robust humour that was fashionable in his day — temptation must have been great. If he did sometimes restore his giant's strength with a fat baby for breakfast, the sailors he snatched from ships struggling past Lands End weren't always treated so summarily. After enjoying his joke to the full, he would occasionally put one back again . . .

Things still have to be lifted from ships by giant strength and reach, but the modern giants — the kind that S & H build — are predictable creations which draw their energy from more humane sources.

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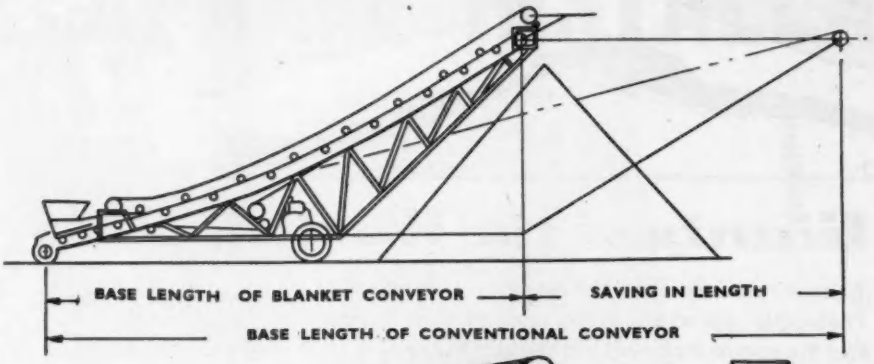

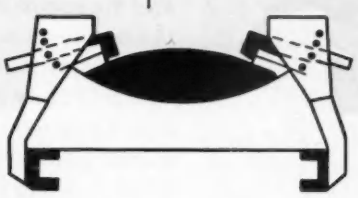

section through conveyor

The "blanket" conveyor (built under licence from the North Thames Gas Board) is a simple arrangement of two continuous belts running one above the other. The lower side of the upper belt runs with the upper side of the lower belt, forming a tubular cross-section. The edges of the belts are held together by idlers above and below the belt run. A portable version of the design is illustrated here

maximum elevation

PLUS...

- less cost per foot rise
- shorter, lighter construction
- increased manœuvrability
- reduction of dust nuisance

BIRTLEY

The illustration shows the "blanket" conveyor elevating granular material at 40° as compared with the 18° inclination of a conventional conveyor.

PORTABLE blanket conveyor

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. . . said our Lady Consultant

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THE ENVOY III

lights at the turn of a tap!

Only the 'Envoy III' gives you fully automatic lighting and the exclusive BAKE/WARM control *(which operates at the turn of a tap to keep food warm without drying)* plus all these luxury features:— Short splash-back has built-in timer; 'Glide-over' hot-plate stops pans tipping; roomy, enclosed grill; oven big enough for the largest turkey; plate warming drawer in base—and many more Flavel exclusives.

** Also available with tall splash-back and plate-rack*

The only cooker at the price with automatic lighting to Oven, Hotplate and Grill

This is one of the striking new advertisements now selling the new Flavel ENVOY III—in leading national, Sunday and evening newspapers; and in leading magazines. Put the ENVOY III in the spotlight in your showroom. Because everyone who wants a new cooker will want to SEE A FLAVEL FIRST!

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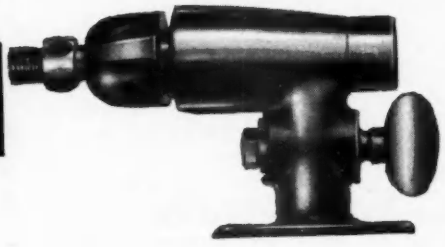
Modern Gas Fittings



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The name of Whitehouse has been famous since 1872 for accuracy and fine finish.

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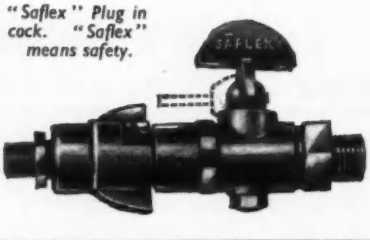
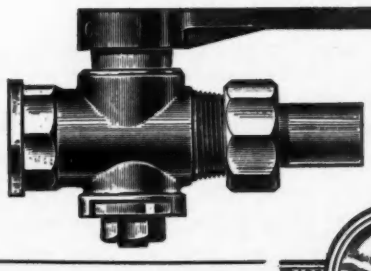
"Saflex" Plug in cock. "Saflex" means safety.





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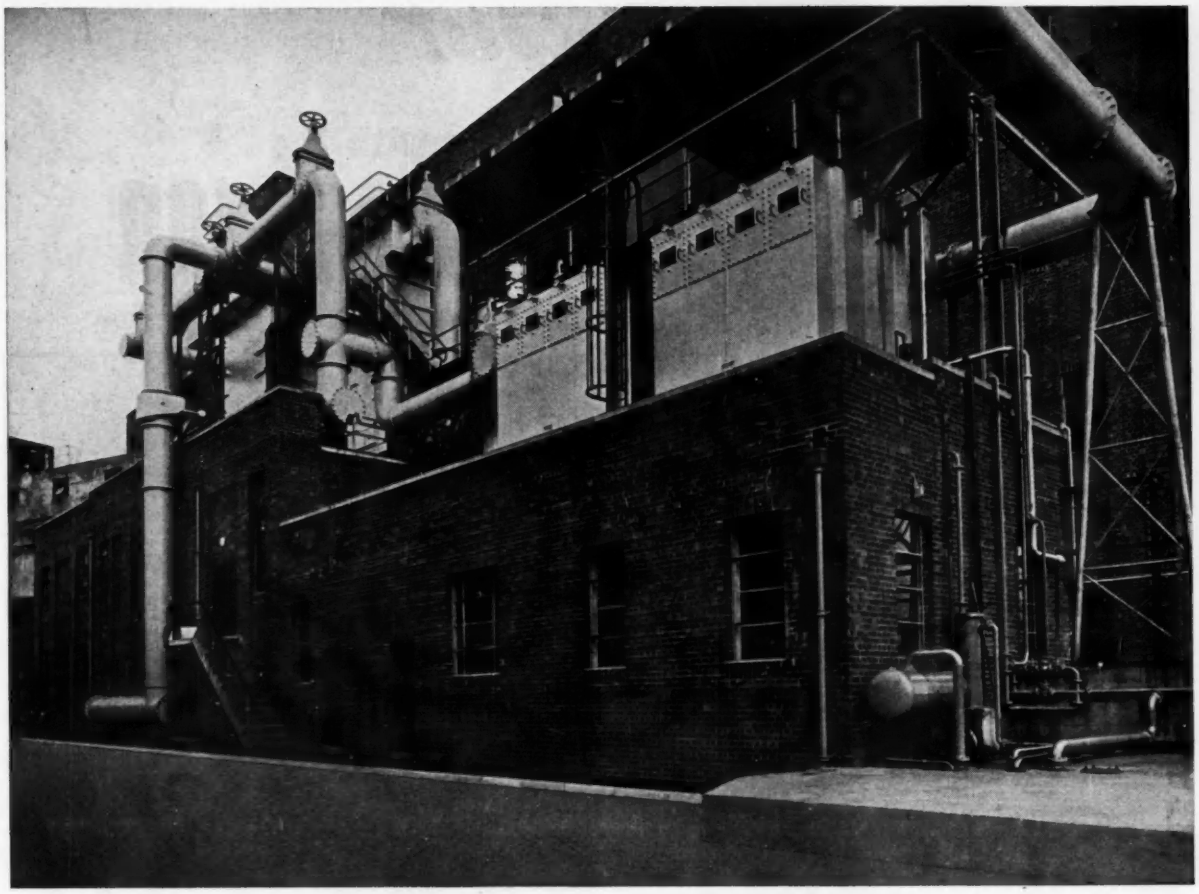

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MV2

Why WALLER?

Waller Wagon Tipper installed at the New Works Extension, Stoke-on-Trent.
Photo by courtesy of West Midlands Gas Board.

2 *Wagon Tippers*

"A chain is as strong as its weakest link." Bearing this well-known maxim in mind, Waller ensure that their machines are made to the highest, *all-round* standard attainable. One of the "links" in the wagon tipper is the *steel* ram, used for strength and resilience in withstanding shocks, such as impact of wagons when shunting. Here is *another* answer to "Why Waller?"

Other WALLER Equipment includes:
Exhausters
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Valves
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GEORGE WALLER & SON LTD

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All Crane Malleable Iron Pipe Fittings and Unions are individually tested!

The searching tests given to every individual fitting and union at the Crane factory ensure the consistent high quality of these well-known products. Their good appearance, clean finish and dependability have long earned them the confidence of the most exacting buyers.

Plain and Banded Pattern Fittings

All Crane Malleable Iron Pipe Fittings have taper threads and are manufactured to British Standard No. 143. They are available in plain and banded patterns with either black or galvanized finishes. Sizes (equal and reducing) $\frac{1}{8}$" to 6".

All Iron, Railroad, Navy Pattern and Flat-face Unions

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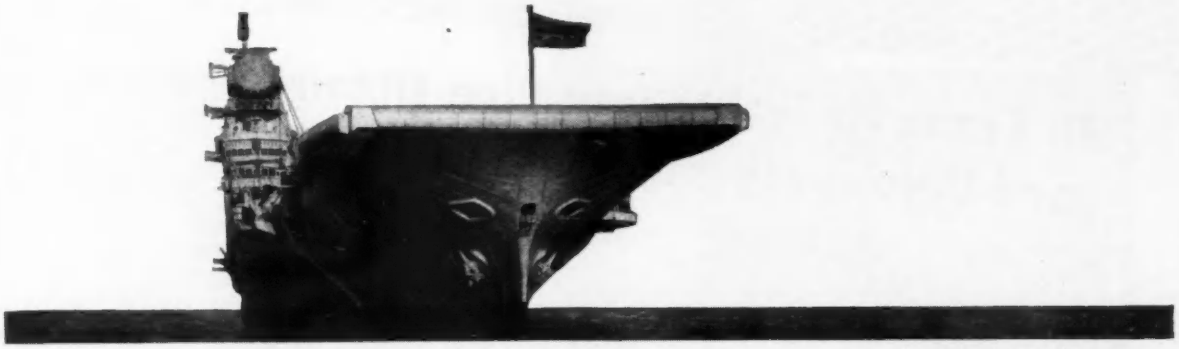

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FIRE-RESISTANT HYDRAULIC FLUID

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It is: Non-corrosive
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Non-toxic
Non-fuming

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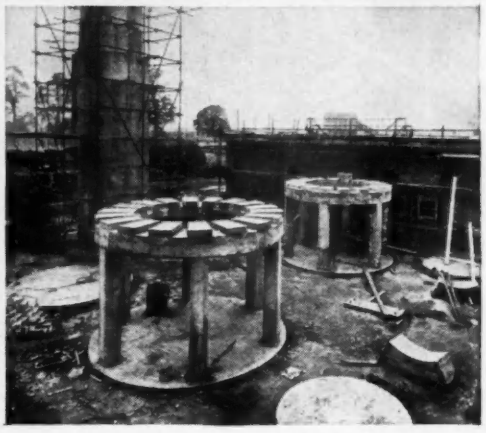

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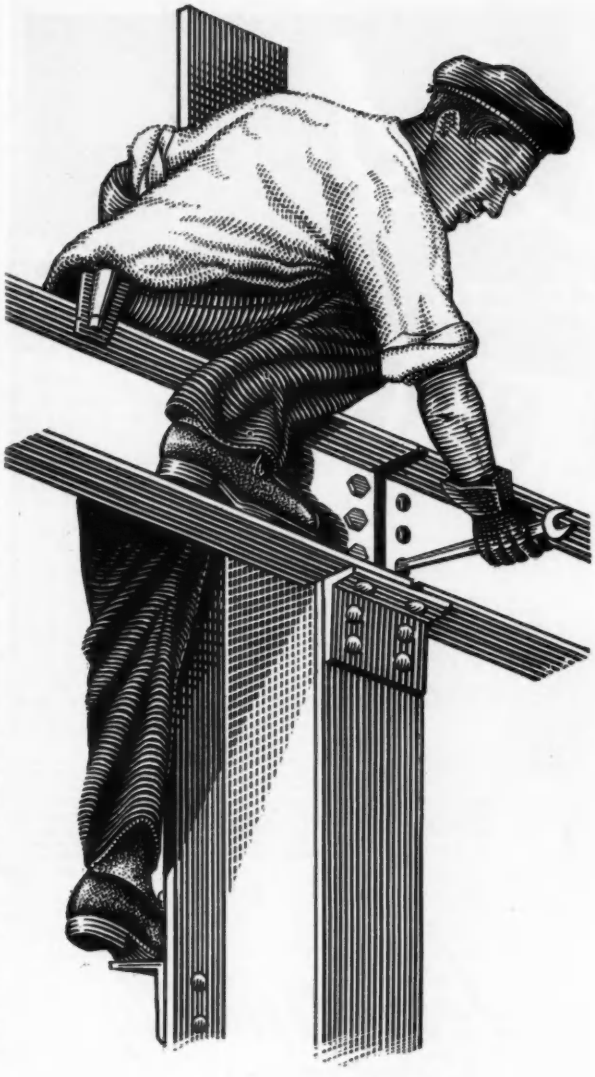

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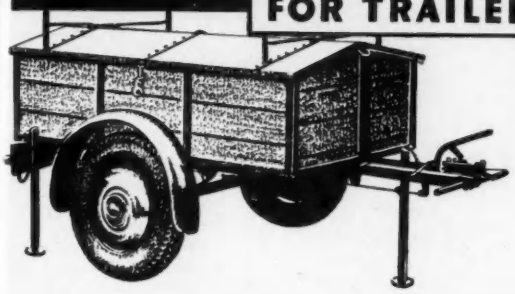

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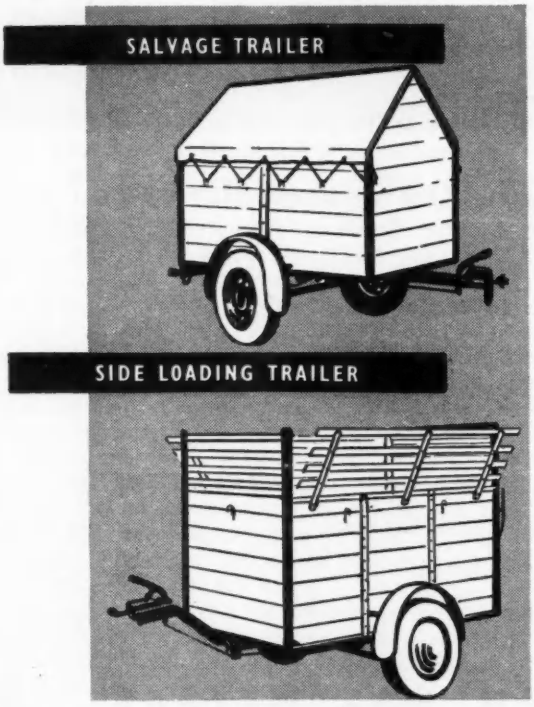

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Gas Journal

VOL. 295 NO. 4966 SEPTEMBER 17, 1958

110TH YEAR

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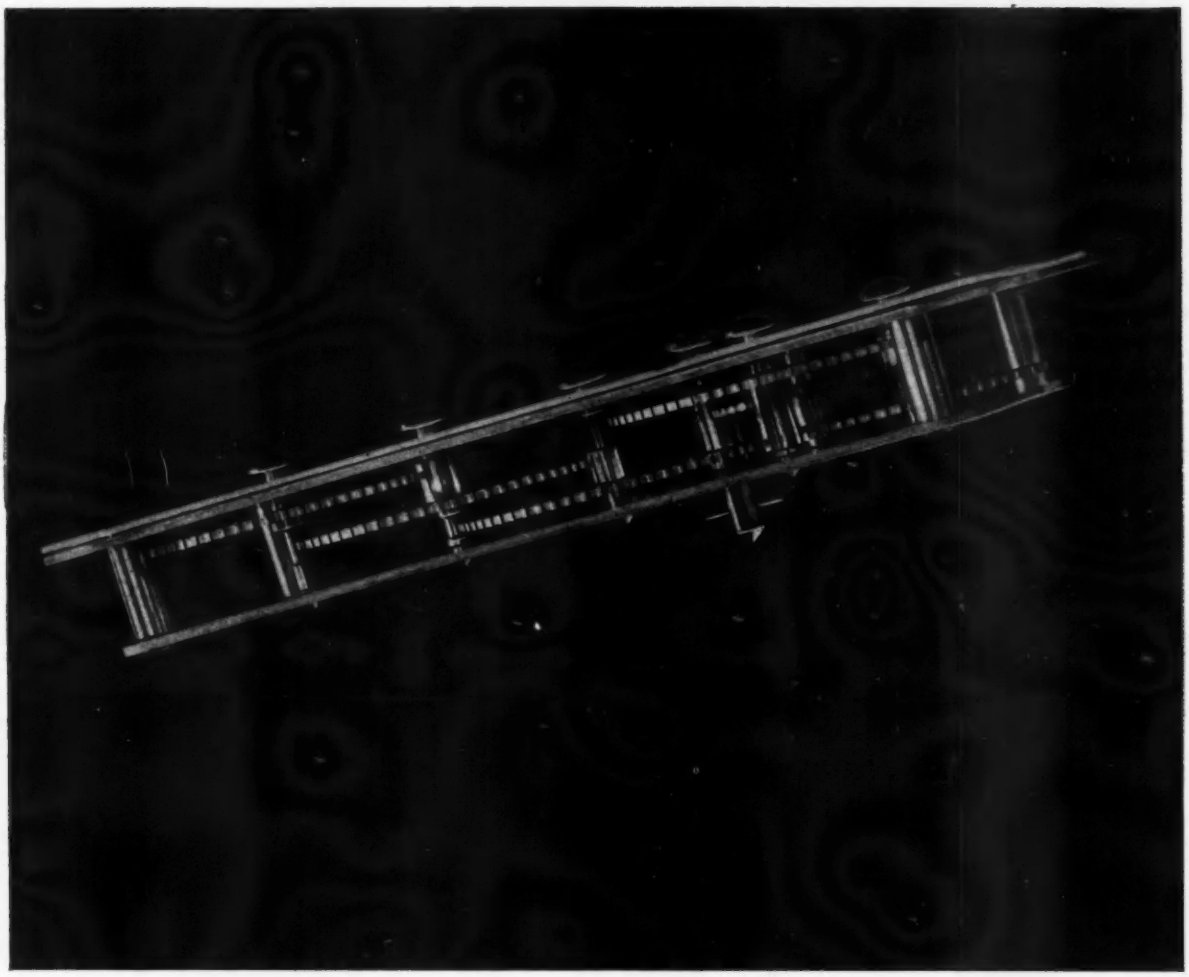

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Gas Journal

VOLUME 295. No. 4966 SEPTEMBER 17, 1958. 110th YEAR

Gas in Europe

WE are publishing this week a review of 'Gas in Europe,' the first report of the Gas Committee of the Organisation for European Economic Co-operation. Any document describing in detail the gas industry on the Continent is of considerable interest to our own gas industry, especially when an account of the British industry is included. The differences in structure and organisation between the two industries can then be all the more easily seen.

Although this report is the first to be published by the Gas Committee, which was set up early in 1956, it is not the first issued by O.E.E.C. An earlier report appeared about two years ago and we published a long abstract of it at the time. This report consisted of a reasoned background to the European gas industry in general terms and, after going into the conditions then obtaining in some detail, went on to forecast possible developments. It dealt essentially with the economics of the industry in Europe. It pointed out that although gas in itself was a suitable fuel for a great many purposes, both domestic and industrial, steps must be taken to make its price more competitive with rival fuels. It stressed the need for exploiting all methods of gas-making, both in use then and those being developed and shortly becoming commercially possible, if such processes would in fact reduce the price of gas. This, the report pointed out, was urgent.

The present report goes further and describes the gas industries in each country in the O.E.E.C. area in varying detail; the detail naturally depending on the importance of the industry in each country.

The gas industries in this area may be roughly divided under two main heads; those countries which produce gas in an ever decreasing number of gasworks and those which rely largely, but not entirely, on some external source such as coke ovens, or if they are fortunate, on natural gas. In the first category come the United Kingdom (and Ireland), Scandinavia, Luxembourg, Switzerland, Portugal, and Greece; and in the second, Western Germany, Belgium, France and the Netherlands. The gas industry in Italy, with the discovery of natural gas in the Po Valley, has expanded considerably in the last few years by making the greatest possible use of this source while supplying the remoter country districts by the distribution of liquefied petroleum gas in individual containers. Included in the area under review are the gas undertakings in Turkey which are confined to the larger cities, statistics for Ankara, Istanbul, and Smyrna being given. The development of gas in the first two cities would seem to have only taken place after the 1914-18 war; the Istanbul works, operated by the Electricity and Tunnel Authority, was built in 1925; and that in Ankara, operated by the City Council, in 1929. The Smyrna undertaking, however, dates from 1860.

The report is divided into three sections. The first, 'The Gas Sector in the O.E.E.C. Area,' deals with economic considerations and the present position with possible lines of development; a concise form of the earlier report with developments that have taken place up to 1956. The second section, 'The Gas Sector in Member Countries,' describes in detail what developments are actually taking place in those countries and supplies excellent statistical information. For the larger gas industries a diagram is included showing the source of all gas produced and its disposal to various classes of consumers. A form of diagram which seems commoner on the Continent than in Great Britain. The third section consists of 'annexes' or appendices which give the statistics for the area as a whole for the years 1954, 1955, and 1956, and is complete with its production and consumption diagram.

Perhaps the most interesting developments are those taking place in France as a result of the discovery of

very large reserves of natural gas at Lacq in the south western part of the country. Now that the problems, which the use of this gas poses—it contains about 15% of hydrogen sulphide—are being solved, the French gas industry would seem to be on the point of vast expansion.

Reading the report once more stresses how very much more the gas industry in Great Britain has been developed than in Continental countries. The density of population in these islands naturally favours the transmission of gas over shorter distances compared to the much greater distances to be covered in France or Germany, the only two countries with a comparable gas consumption. The natural gas in France, however, is likely to change this, since it appears that it will eventually be supplied to the large industrial centres and is likely to reach Paris by 1960-61. After that date a very steep rise in consumption by both domestic and industrial consumers is forecast.

The report makes it clear that such developments are likely to have a profound effect on the availability of energy in Europe. After the last war there were signs that, to provide the industrial expansion expected in industrialised Continental countries, considerable imports would be needed.

H.P. Concessions

MR. SYDNEY SMITH, Chairman of the Scottish Gas Board, always a realist, must nevertheless have been profoundly moved at the beginning of this week. For, only a few days after he had told the Scottish Association of Gas Managers that the sale of gas appliances in Scotland could be doubled if hire purchase restrictions were removed lo! they are abolished, on cookers, water heaters and wash boilers at any rate. And the efforts to sell space heaters will be greatly helped this winter by the reduction from 50% to 33⅓% deposit required. This is also the deposit now needed by purchasers of refrigerators not exceeding 12 cu.ft. capacity, drying cabinets, washing machines, and dish washers.

Anomaly, it seems, is still to plague the area of restriction. The housewife entering the showroom will be discouraged from buying a washing machine by having to pay a substantial deposit; and encouraged to get a wash-boiler instead, presumably lest she should become spoilt and pampered by the evils of mechanisation.

Gas fires too are still thought of apparently as being in the same luxury bracket as juke-boxes, hair-dryers and cameras. So unless you can pay out 33⅓% on what is surely a prime necessity, in all probability you will carry on making a mess with coal. At this particular time, when cleaning the air is also the subject of legislative attention, space heaters might easily have been cleared of restriction without any concession to a new inflationary spiral.

Are not refrigerators now considered necessary kitchen equipment, not to mention drying cabinets, especially in the blocks of flats and maisonettes where outside drying is impracticable and undesirable?

Concessions, however, are concessions, and there is no question that while we wait for the last shackles to be broken, gas salesmen, and for that matter, everyone whose livelihood depends on stopping the decline in the domestic load, must be feeling greatly encouraged this week.

The 'Bulge'

AS a result of the increase in the birthrate during the second half of the last war and in the immediate post-war years, the number of 15-year-olds in the population will increase by 1962 to 52% over the 1956 figure. By 1965 the number will have fallen to 20% over the 1956 figure and will remain at that level until 1971, beyond which it is not possible to predict with any certainty.

'It seems unlikely,' concludes the writer of an article entitled 'Young People at Work: Some Statistics' in a recent issue of *Occupational Psychology*, the journal of the National Institute of Industrial Psychology, 'that these children of the "bulge" will face unemployment. If increasing industrial or other activities should prove insufficient to absorb the extra numbers who will become available, it seems likely that the brunt of this will be borne by other sections of the working population, such as married women, older workers and the disabled. The main difficulties so far as young persons are concerned are likely to arise from the fact that this substantial increase in numbers will occur at what is the traditional training age. Hence the main problem posed by the "bulge" will be one not of employment but of training.'

Three factors have affected occupational trends in the recent past. These are increasing technical complexity; the increase in the size of industrial and other units; and the rise in the standard of living. The effect of a continuance of these factors should be to decrease the proportion of the working population employed on productive work and to increase the proportion employed on technical, administrative and clerical work and on 'service' occupations.

Published also in this issue of *Occupational Psychology* are three of the papers read at a symposium on the relation between economics and psychology, which formed part of the Annual Conference of the British Psychological Society in April this year. The papers published are by Sir Geoffrey Vickers, v.c., Professor G. L. S. Shackle, Brunner Professor of Economic Science in the University of Liverpool, and Mr. D. C. Duncan of the staff of the National Institute of Industrial Psychology, who was convener of the symposium.

Clean Air Act

A NEW handbook on the provisions of the Clean Air Act which came into full operation on June 1 has just been published by the Federation of British Industries, entitled 'A Guide for Industry to the Clean Air Act, 1956' (FBI, 21, Tothill Street, London, S.W.1, price 4s.) It brings up to date the Federation's previous publication on this subject and includes the regulations which the Minister was empowered to make under the Act.

Intended as a working manual for the information of works managers and engineers, the booklet is divided into three parts; the first, on how to combat smoke, the second on how to combat grit and dust, and a third miscellaneous section.

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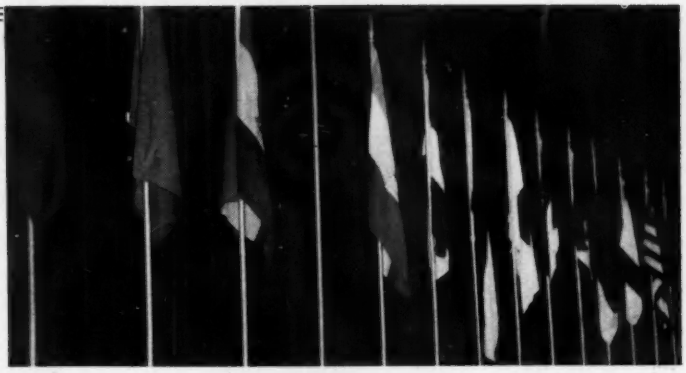

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EVERY nation is energy conscious today and there has never been a wider range from which to choose. This being so, the choice of Montreal as the venue of a sectional meeting of the World Power Conference could hardly be bettered. No country has more energy potential and its natural resources are being skilfully harnessed in a variety of ways. This pre-eminent suitability could be clearly discerned when the conference got under way yesterday.

by The Editor

Against a backdrop of the flags of the 51 member nations, representatives of the Government of Canada, the Government of the Province of Quebec, and the City of Montreal extended greetings, to which responses were delivered by delegates of eight different nations and by representatives both of inter-governmental organisations and of international non-government organisations.

Finally, the World Power Conference President, Franz Holzinger, of Austria, officially opened the meeting. Throughout this rather alarming battery of speeches ran a thread of respect for the host country which is expanding its use of fuels and energy resources at an astonishing rate.

Expenses

The planning of a conference of this nature is a mammoth undertaking requiring as much as six years' advance planning. I asked Sir Vincent de Ferranti, Chairman of the International Executive Council, how it all started. The first move, he said, came from Canada which suggested that a conference be held there; such an invitation was not given lightly since it carried with it the guarantee of paying expenses. In such cases the country which elected to play host literally ran the conference with a minimum of interference.

Major-General H. A. Young, Chairman of the Canadian National Committee, took up the story. He explained that in this case funds for the conference came from two sources—from the Federal Government and from various firms. What was somewhat unusual in this case was the fact that the hotel was booked before it was built. Indeed, the Queen Elizabeth Hotel, Montreal, was only completed in April, and labour troubles which accompanied its construction gave the organisers some anxious moments.

They need not have worried, for the conference facilities provided by this fine building, which is actually constructed over the Canadian National Railways' Central Station, are nothing short of fabulous. Certainly we have nothing of the kind in Great Britain, and it makes one wonder why some genius does not provide a similar building in London, designed specifically to house business meetings on the largest scale and at the same time accommodate their delegates.

Related

The theme of the Canadian sectional meeting was 'Economic Trends in the Production, Transportation and Utilisation of Fuel and Energy,' and it was being considered under three main divisions—Production, Transportation, and Utilisation. Understandably, considerable stress was laid on hydraulic energy and nuclear fuel, but thermal energy in the shape of oil and gas had its share; indeed, it seemed to us a little amusing to find these two fuels, so often thought of as being on opposite sides of the fence, considered as being closely related and even directly interlinked.

There was one British paper in

Continued on p. 567.

The members of the Council—a picture taken at Ayr last week.

Scottish Board 'Emerging from Transition'

MR. SMITH LAYS STRESS ON SALES AT ASSOCIATION OF GAS MANAGERS' AGM

MR SYDNEY SMITH, Chairman of the Scottish Gas Board, thinks that the sale of gas appliances in Scotland could be doubled—very easily and very quickly—when hire-purchase restrictions are removed.

He told the members of the Scottish Association of Gas Managers at their annual meeting in Ayr last week that, in spite of these restrictions, there had recently been a 4% improvement in the sale of appliances. It was the first indication they had had for some time of a turn in the right direction.

All the Board's efforts in the way of increased expenditure on publicity, sales organisation, etc., had left them 'pretty well geared up' to go into immediate and effective action when the hire-purchase restrictions, which had been a serious set-back to sales potential, were removed.

'I think,' he said, 'there is every possibility that once these restrictions are taken off our sales should double very quickly. We sold last year just under £1½ mill. in appliances. If we cannot double that very easily, and do it quickly, there is something very far wrong. We are still far behind the other area boards for the sale of appliances. We are behind in every instance except cookers. So I think it is time we pulled our socks up. Sales of gas itself, particularly to domestic consumers, is a matter that is giving us some concern. Owing to a number of factors the average consumption of the domestic consumer is slowly going down.'

In a review of Scottish Gas Board activities, Mr. Smith said that considerable progress had been made with the scheme of complete reorganisation of the Board's administrative structure. Such a scheme inevitably involved considerable disturbance, but they were rapidly emerging from the difficult transitional period and the benefits were now beginning to flow.

Education and training facilities had been stepped up in the anticipation that improved facilities would result in better qualifications, improved interest, and improved quality of work. The sales staff had been substantially increased and attention concentrated on improved consumer service. Vast sums were being spent in publicity of all kinds—'this Board is spending more on publicity annually than any other area board in Britain.'

Mr. Smith said that he did not think everything was being done that could be done to 'sell' the optional two-part tariff to domestic consumers. The tariffs which were introduced a little over a year ago were the finest weapons which any sales organisation could wish to have, but the figures indicated that just under 18,000 consumers had opted for the domestic two-part tariff, and that they had not yet reached the 50% mark of potential consumers who would benefit from adopting the tariff.

Increased volumes of coke-oven gas from the steel works of Messrs. Colville would begin to flow into the Glasgow grid within a matter of days. 'It is entirely due to the efforts of the Glasgow and Western Division, and particularly to Mr. H. R. Hart, that we are getting that into our system some months before we had any hope of expecting it.'

The main was almost completed for taking methane from Cardowan colliery, and supplies were expected by about the end of October.

Since October of last year supplies of about 60,000 to 70,000 cu.ft. of 930 B.t.u. gas had been going into Musselburgh every day from the natural gas well at Cousland. At the end of this year, or early in 1959, boring operations would start in the Salsburgh region, 'where we are hoping that we may get substantial quantities of natural gas.' The underground storage facilities were even more valuable to them than the supplies of natural gas that might be found.

Scotland, he concluded, was fast getting geared up for more rapid progress in all directions, and with the help and enthusiasm of all connected with the industry 'we shall undoubtedly make the grade.'

The annual general meeting—the 97th of the series—of the Association, had a good turn-out of members and an altogether exceptional turn-out of the September sun.

The business proceedings were held in

PROGRESS AT WESTFIELD

Lord Mills will cut the first turf at Britain's first Lurgi plant—at Westfield, in Fife—on October 24, Mr. Smith announced.

It was hoped that the first stage of the £8 mill.-plus scheme would be completed round about July, 1960, when the plant would be producing 15 mill. cu.ft. a day. Two years afterwards the plant should be in full operation and giving 30 mill. cu.ft. a day.

the Civic Theatre, and opened with a welcome from Provost W. S. Lanham.

Sitting with Mr. George Hannah, New Cumnock, the President, on the platform were Mr. D. D. Melvin, Senior Vice-President of the Institution of Gas Engineers; Mr. E. W. Prior, Ministry of Power; Dr. J. Burns, past-President, I.G.E.; and Mr. Sydney Smith, Chairman of the Scottish Gas Board.

Acknowledging a welcome from the President, Mr. Melvin remarked that in the furtherance of technical knowledge the Institution had a continuing task of great responsibility. 'It is keeping in line, and, we hope, a step ahead of the times, in providing those qualifications suitable to entrants to the industry.'

Dr. Burns said that the load level over the past few years in the gas industry had been a matter of some concern. The reason was that the price was too high in relation to competition. 'It is quite clear that you in Scotland are doing something about it. Everybody in the industry will wish you well. It may point the way to what should take place elsewhere. We are all inclined to talk about the fact that something must be done; there is a necessity to do more than talk.'

New Technique

In his Presidential Address Mr. Hannah discussed current aspects of the gas industry in Scotland, and commented:

'Gas no longer sells itself, and it must now be sold against increasing competition. Such competition demands new technique—new methods of approach to the consumer—and not the least, the high level approach to town and county councils, who are in the main the largest builders of new houses. All of these angles associated with sales are being given the expert attention they deserve.

'While this is all to the good, I feel that in the domestic field the efforts of the salesman can be nullified by the uplift applied to sales. In my humble opinion the appliances should be made available at the cheapest possible price so as to obtain the maximum number of them on the district, and thus keep up the consumption per consumer. Gas appliances by their price must never be allowed to be thought of as luxury articles. They must be kept in the category of a 'must.' They are essentials of life.

Half-price Gas

'The commodity charge plays a very important part in the economics of the industry, and I do hope that the bold and courageous policy of half-price gas achieves the success it deserves. To have a standard price for Scotland is something I thought I would never see, and I am perfectly confident would not have been realised but for nationalisation. It also, surely, reflects the breadth of imagination and courage of the Chairman and his Board to put into operation such a scheme. It also puts into the hands of the field salesman a potent weapon for that additional appliance sale.

'When the results of the half-price gas and other tariffs are being assessed, may I suggest that the commercial tariff be amended to include a section for church halls, meeting rooms, etc., which are principally used in the evening. I have no information concerning the extent of this business, but being an off peak load the possibilities are, in my opinion, worth looking into.'

A paper on 'The Prevention of Back Strain in Industrial Weight Lifting,' was given by Dr. D. G. Waddell, the Scottish Board's Medical Officer, who stated that accidents, and especially those to the back, due to handling of goods, were a major industrial problem. They were all familiar with the exhortation, 'Put your back into it,' conjuring up a picture of taut and bulging muscles in a 'do or die' feat of strength. Such advice was unsound. Where weight lifting was concerned, 'Keep your back out of it,' was much more appropriate. Training in the principles of correct weight lifting was available and had been shown to be effective in reducing accidents from the handling of goods.

He suggested that a suitable training scheme introduced into the Scottish Gas Board area would be an advantage, though suitable training was not the full answer. To it should be linked increased mechanical handling, further work study, and a critical appraisal of all safe working practices.

In conjunction with the paper, Dr. Waddell showed the I.C.I. film 'Kinetics in Manual Handling,' which demonstrated the principles of correct weight lifting.

Mr. G. J. B. Cox, Edinburgh, said that statistics available at Granton gasworks supported the theory that there had been an increase in these trunk accidents. The real reason appeared to be the lack of training, and he supported Dr. Waddell's appeal for more training for men who were doing this class of work.

Mr. J. F. Foster, Largs, said that a great deal could be done to prevent accidents. 'We should be better housekeepers, and not merely slap on paint indiscriminately when we expect the Chairman to pay a visit. A great number of the accidents in our industry are caused by uneven cement flooring, shaky ladders, damaged tools, and numerous other items due to bad housekeeping. In facing this problem the workman should be saved from himself and his fellow-workmen and not the machines. Better housekeeping is the management's responsibility, and I think workpeople have a right to work in the best conditions.

Mr. C. B. S. Mitchell, Glasgow, commented that all too often they saw lifting jobs, involving heavy tackle and sometimes even cranes, being undertaken by men who hadn't the slightest 'know-how' of the mechanics of the process, let alone of the correct slinging procedure. Was it any wonder, therefore, that accidents happened? They did not always involve injury to life and limb, but could involve damage to the load being lifted or to the lifting machinery itself.

Underground Corrosion

A paper entitled 'Underground Corrosion and Cathodic Protection of Gas Pipelines and Equipment,' was presented by Mr. J. S. Gerrard. Mr. S. K. Paterson, Glasgow, and Mr. J. Fulton, Kirkcaldy, carried on the short discussion. (This paper was first read to the Midland Section and published in the 'Gas Journal' of March 5, 1958.)

Introducing 'A Review of Education and Training in the Scottish Gas Board,' Mr. R. J. Faulkner, the Board's Education and Training Officer, said that part of the success in training depended on the quality of young men on entry. The shortage which had existed in recent years would remain a problem for the next year or two, but the situation would

Left to right: Lord Mathers, Mr. H. R. Hart, Mr. D. D. Burns, Members, Scottish Gas Board.

change due to the increased number of boys who would leave school between 1961 and 1964, having reached the age of 15. Adding a further two years in respect of those boys who would take their Scottish Leaving Certificate with subjects on the higher grade, the peak leaving year would be 1964. After 1966 the annual figure of boys leaving school would drop back to the present rate. the possibility of military service ceasing towards the end of 1960 would have its effect on recruitment. The gas industry should take advantage of this increase in the number of school leavers. It should mean that they were able to get boys of better academic ability, and he strongly recommended that recruitment should be stepped up during this period in order to counteract the possible leaner years of the 1970s.

In order to increase the number of salesmen, he continued, it had been necessary to appoint men from outside the gas industry. Serious thought must be given to the replacement of these men when vacancies occurred through normal wastage. Some schools of thought were of the opinion that the qualified gasfitter made the best salesman, and providing such a man had those other qualities which were so important to the salesman —appearance, acceptability, persuasiveness, enthusiasm, and good speech—he agreed.

However, apprentice gasfitters were not normally appointed bearing in mind these qualities, and therefore it was not surprising that so few satisfied the requirements of a sales post in later years. Was it not worth while considering the possibility of commencing a limited training scheme for likely young men with these qualities, who, after adequate training, would take up posts in the sales organisation, rather than rely on the few suitable gasfitters or mature men from outside the gas industry?

Mr. D. Beavis, Edinburgh, Chairman of the Scottish District Committee of the I.G.E. Education Scheme, welcomed the appointment of Mr. Faulkner to his post with the Board. There was complete harmony between the educational programme of the Board and the educational policies of the I.G.E. and of the Scottish Gas Education Committee.

A great step forward had been made possible during the year by the Board's decision to support fully a four-year day course in civil engineering for gas engineers in the Heriot-Watt College, Edinburgh. Such a course had long been the ideal objective of the Education Committee.

Mr. J. Fulton, Kirkcaldy, disagreed with Mr. Faulkner's statement 'that the training of 30 years ago makes it difficult to keep abreast of the rapid developments such as we are now experiencing.' He was disappointed that the emphasis in attendance at the classes in gas engineering at the central institutions appeared to be on manufacture and not on distribution. He hoped that some effort was being made to attract the attention of some of the younger engineers to distribution, which was very important at the present time with the big integration schemes they had in hand.

Keeping Up-to-date

Replying, Mr. Faulkner said he still contended that it was very difficult for many of their engineers to keep up to date in depth with some of the modern developments. He agreed that they should make their contribution to the future distribution work by making sure that it received a fair quota of highly skilled and technical men.

Mr. David Fulton commented that it seemed to him that there was an undue accentuation of the academic side of education and rather too little attention paid to practical training—the manual work.

He thought it was really necessary, in a country like Scotland, not to dissipate their efforts in practical or academic training by having apprentices scattered all over the country. He thought two centres at most, probably one, would be sufficient. Mr. Fulton added that because of the closing down of so many gasworks in the country they were in danger of losing a source of recruitment.

When a works no longer existed in a town, the idea of entering the gas industry might go out of the minds of young men in that area. Something might be done to correct that by going to the schools and giving lectures on the possibilities of the gas industry.

Mr. A. McFadyen, Glasgow, was installed as the new President, and it was announced that Mr. D. Beavis, Edinburgh, had been elected Junior Vice-President. The past-President's emblem was presented to Mr. Hannah by Mr. W. M. Gledhill, Stirling.

Left to right: Mr. Sam Hall, Mr. J. G. Rutherforth, Mr. T. Thomson, and Mr. John Ford.

Mr. and Mrs. G. Hannah with Mr. and Mrs. Sydney Smith.

BOWLING CLUB

Seven years ago the Scottish Association of Gas Managers' Bowling Club held a dinner to mark the jubilee of its inauguration. This year there was again a dinner and it coincided with the completion of 25 years yeoman service of its Secretary, Mr. Tommy Thomson, who is exchanging wood for sandblaster and taking over the task of golf secretary.

The Chair at dinner was taken by Mr. Lewis Bain, sen., in the regretted absence of President Gilchrist. The toast of 'The Club' was proposed in inimitable

comedy by Mr. T. B. Noble, whose connection (as journalist until his retirement) with the gas industry goes back for 28 years odd.

Mr. W. A. M. Stewart proposed 'The Guests' and Mr. Sydney Smith (Chairman of the Board) replied, remarking that one of the duties imposed upon him by the Gas Act was to foster the well-being of the employees. He was confident that the Bowling Club brought fellowship and relaxation to its members. Was it not time for them to consider the formation of a Ladies' Bowling Club?

Mr. J. G. Rutherforth, of the Executive Committee, referred to the amount of work required to carry through to success the affairs of such a club and particularly the present function. The merit lay, perhaps as to 95%, with Mr. Thomson.

Annual Competition

The annual Competition was held the following day, Thursday, September 11, when the cup was won by a rink composed of J. G. Rutherforth (skipper), A. T. Herd, C. Varcoe, and R. B. Louden. This rink finished 14 shots up. Second prizes were won by the following rink which was 10 shots up: R. J. Philp (skipper), T. B. Noble, R. H. Bone, and J. Ford. Prizes were presented by Mrs. George Hannah. At the annual meeting of the club, Mr. Thos. Thomson was elected President and Mr. C. J. Gregg Hon. Secretary and Treasurer.

GOLF CIRCLE

The Autumn Competition was played in fine but misty weather over the beautiful links of the Kilmarnock (Barassie) Golf Club, when the Challenge Bowl and replica were won by Mr. J. B. Clay with the excellent score of 85−16=69. The Winson Scott Veterans' Cup was won by Mr. R. Stewart with 76−2=74.

First prize, Section 1, went to Mr. S. K. Paterson; Section 2 to Mr. J. McPherson. The Visitors' first prize was won by Mr. Gordon Bennet.

At the Annual General Meeting which followed play, the prizes were presented by Mrs. Clifford King, wife of the retiring Captain. Mrs. King was thanked by Mr. E. G. Smith and received a beautiful purse as memento of the occasion.

Mr. E. G. Smith was elected Captain and Mr. J. M. Adams Vice-Captain for the ensuing year. Mr. W. P. Rae is new Member of Committee and Mr. T. Thomson Hon. Secretary and Treasurer.

Presentation to W. P. Rae

Mr. Willie Rae was presented with a portable wireless set, and Mrs. Rae with a memento, to mark his retirement from the secretaryship. In making the presentation Mr. Clifford King referred to the 13 successful years during which Mr. Rae had carried out a job of no mean magnitude. He had done so with meticulous care, industry and tact, and thereby had earned the gratitude and affection of all the members. Mr. E. G. Smith spoke in support and Mr. Rae's reply brought a further round of applause.

Above: *The winning rink in the bowls competition, from the left—with the Secretary T. Thomson, R. B. Louden, A. T. Hird, J. G. Rutherforth, skip and C. Varcoe.*

Right: *The new Secretary of the S.A.G.M. Bowling Club Mr. C. J. Gregg, left, receives the congratulations of the retiring Secretary, Mr. T. Thomson.*

LADIES' GOLF CIRCLE

A competition for the Handley Salver and other prizes was played over the Belleisle Course on the Thursday morning, when the Salver and first prize were won by Mrs. A. McFadyen. Mrs. Duncan Melvin was second and Mrs. George Keillor third. The scratch prize was won by Mrs. L. Fletcher.

Mrs. D. D. Burns remains Captain, and Mrs. Fletcher, Secretary, of the Circle.

Personal

MR. SAMUEL DAVIES, District Manager for the East Midlands Gas Board at Doncaster until he retired on July 31, was recently presented with a dressing case by Mrs. E. C. Williams, Chairman of the Doncaster branch of the Women's Gas Federation.

MR. MORTON GORDON has been appointed by Metal and Pipeline Endurance, Ltd., as acting Chief Welding Engineer in place of MR. R. B. WHALLEY, resigned.

Annual Bowling Match

The annual bowling match between the Scottish Association of Gas Managers Bowling Club and the Scottish Gas Board, Edinburgh and South East Division, was won at Granton Bowling Green on August 30 by the Scottish Gas Board, who were 21 shots up.

Livesey Bowls Club

Livesey Memorial Bowls Club recently won the County Rink Championship and subsequently reached the final of the English Bowling Championship, which they lost narrowly.

Diary

September 18. — INCORPORATED PLANT ENGINEERS (BLACKBURN BRANCH): White Bull Hotel, Blackburn. 'Recent Advances Towards Thermonuclear Power (Sceptre and Zeta),' by J. E. Read. Joint meeting with the Institute of Fuel. 7.30 p.m.

September 20. — SCOTTISH WESTERN JUNIORS. President's Day. Joint visit with East of Scotland Juniors to new plant at Provan gasworks. 2.30 p.m.

September 22. — WEST MIDLANDS G.C.C.: Edmund Street, Birmingham 3. Meeting at 2.30 p.m.

September 24. — I.G.E. (NORTH OF ENGLAND SECTION): Yoden Road Common Room, Peterlee, Co. Durham. Paper on 'The New Towns of County Durham—Their Economic and Social Contribution,' by Mr. A. V. Williams. 2.30 p.m.

September 25.—NORTH THAMES G.C.C.: Westminster City Hall, Charing Cross Road, W.C.2. Council Meeting.

Minister to Officiate

Lord Mills, Minister of Power, will open a clean air exhibition to be held by the Royal Society of Health at its London headquarters, from November 3 to 14.

Gas has put up a powerful showing since the war, says O.E.E.C. report

ONE of the most significant features of the European energy situation in the post-war period has been the powerful showing of the gas industry in face of stern competition from other forms of fuel. This fact has been recognised by the Commission for Energy of the Organisation for European Economic Co-operation (O.E.E.C.) which, early in 1956, established a Gas Committee to study problems relating to the production, transport, distribution and utilisation of gas in the O.E.E.C. area.

In its first report, which has just been published, the Gas Committee offers an exceptionally well documented account of the O.E.E.C. gas sector, comprising an appraisal of the present position and an indication of future problems and prospects.

No Easy Task

To attempt a survey of the gas industries of so large and complex an area is no easy task, and the Committee wisely decided that for its initial report the best plan was to produce a country-by-country survey, based on data supplied by the territories themselves, supported by statistical information covering the whole of the O.E.E.C. area. With the exception of Iceland, all the remaining O.E.E.C. countries are represented, namely, Austria, Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Sweden, Switzerland, Turkey and the United Kingdom.

Although the economic considerations relating to the production, transport, storage, distribution and utilisation of gas over this widely diversified area are as complex as the technical factors involved, the Committee nevertheless feels that the countries concerned can be classified under three main headings, according to the structure of their gas industries.

In the first of these groups, gas is mainly, or in some cases exclusively, produced in conventional gasworks. Countries in this group, apart from the United Kingdom, include the Scandinavian countries (Denmark, Norway and Sweden), Luxembourg, Portugal, Greece and Ireland. The second group comprises countries with a mixed structure, where gas is produced in comparable quantities in conventional gasworks as well as in coke-ovens and blast furnaces. In these countries, there is frequently a strongly-developed interconnection system between centres of production and consumption, sometimes involving long-distance transmission. Typical examples of this group include the German Federal Republic, Belgium, France, and the Netherlands. The third group, in which long-distance transmission systems also play an important part, comprises countries where natural gas has an important part, as in Italy.

To this general classification, however, the Committee's Report adds the rider that no clear distinctions can be drawn for not only is gas being produced by a fairly large number of different processes in practically every country, but the structure of the industry is constantly changing. For example, new discoveries of natural gas are being made, the oil refinery industry is yielding increasing supplies of refinery tail-gases, and new gas transportation systems are continually being developed for gas of all sorts.

This point is well illustrated in the section of the Report which deals with the United Kingdom where reference is made to the recent increase in the use of coke oven gas under contracts between the gas boards and the National Coal Board, the iron and steel industry and other coke ovens. As is well known, plant for the gasification of oil has been erected by most area boards while contracts have recently been made with oil refineries for the supply of tail-gas.

Unconventional Methods

Looking to the future, the United Kingdom section of the Report anticipates a considerable increase in the output of gas from what may perhaps be termed 'other than conventional' methods. In some measure, this trend stems from the fact that the bulk of the gas industry is based on carbonising plant which is inflexible in operation, has high manpower requirements and demands supplies of coking coal which are tending to diminish. Moreover, the increasing demand for gas by industry is bringing its own problems, for example, a growth in the maximum day's demand which, in some areas, is several times the rate of the growth in total demand.

In the absence of any sizable reserves of natural gas or the prospect of the discovery of large underground reservoirs for the storage of gas against peak demand periods, it is felt that the British gas industry must develop plant of low capital cost and labour requirements capable of using a wide range of raw material. The Report makes reference to the many developments which are already in hand or are being contemplated in the United Kingdom to meet these problems, including the use of lower rank high ash content coals, the production of gas by a hydrogenation process, the conversion of refinery tail-gas into town gas and even the proposal to transport liquefied gas by sea in a converted tanker.

Integration Report

Reference is also made to the trend towards concentration of gasworks into a smaller number of units through integration. By this means, the total number of gasworks in the United Kingdom, which stood at 1,050 in 1948, will have been reduced to little in excess of 500 by 1960.

This trend towards the concentration of the gas producing facilities into a smaller number of integrated units is a feature of many other O.E.E.C. countries. In Luxembourg, for instance, the original 11 units have now been reduced to six, and of these the installation in the capital city has a capacity equal to that of the other five combined. Another interesting feature of the Luxembourg gas industry is the fact that although gas has in general been superseded by electricity for lighting purposes, it has stood its ground in heating applications and, in fact, both the production of gas (21,750,000 cu. m. in 1956) and the number of consumers (43,400) have risen steadily since the war.

Like several other of the smaller O.E.E.C. countries, Luxembourg has no indigenous coal supplies so that the steadily increasing demand for gas poses serious problems of supply. One proposal for meeting this situation, which has been under consideration for some time, is to obtain supplies of coke-oven gas from the Gaz

The Oil Gasification Plant to be built by Woodall-Duckham Construction Company Ltd. at the South Eastern Gas Board's Isle of Grain Works.

The Installation will include Shell Gasification Plant with associated Oxygen Plant as well as Ancillary Plants for H_2S removal, CO conversion, CO_2 removal and power generation. It will produce more than 18 million cubic feet of gas daily and is to be completed in 1960.

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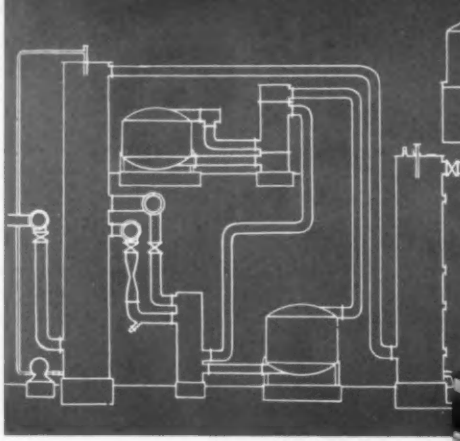

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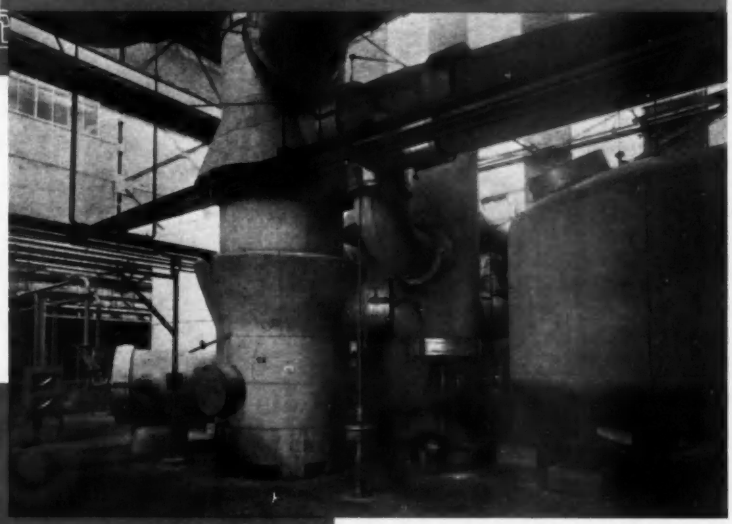

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de France network. Gas from this source would be supplied at some suitable point on the Luxembourg-Lorraine frontier and fed into a newly laid out transport network for conveyance under pressure to new or existing distribution centres.

More recently, a Luxembourg iron and steel works has proposed the setting up of a coking plant which will provide another useful source of coke oven gas.

In Sweden, although gas only represents about 1% of total fuel and power consumption, the output of gas has risen steadily in recent years, a decrease in household consumption having been more than counterbalanced by a rise in commercial and industrial uses, particularly in the metallurgical industries, laundries and the food processing industries.

Town gas in Sweden is mainly produced in horizontal and vertical retorts with only a limited quantity in water-gas plant. At peak periods, propane/butane is fairly widely used, being blended with air or producer gas and incorporated in the ordinary town gas. It is interesting to note that although production methods in Sweden today are basically the same as those used when the industry was established a century ago, improved technical knowledge has resulted in rising productivity. Within the last 25 years, for instance, the volume of gas per labour unit produced by the Stockholm works has risen by more than 25%.

True Strength

It is when the Report turns to consider the larger Continental countries that the true strength of the European gas economy is seen. This particularly applies to a country like France whose gas supplies are derived from a variety of sources which are continually changing in accordance with technical and economic considerations. According to figures given in the Report, almost equal quantities of gas are derived from gasworks and coke ovens at pitheads with a further considerable quantity produced at iron and steel works. A growing source of supply is, of course, natural gas which is today the feature dominating the French gas situation.

With the discovery of the Lacq natural gas deposits in the south-west it is claimed that the result may 'even cause a change in the economics of carbonisation.' An indication of the importance of these deposits is provided by the figures of actual and estimated production of crude gas (in thousand cu. m. at 9,000 Kcal) which showed 1,000 per day in April, 1957, an estimated 5,000 per day by the end of the present year, 10,000 per day by the beginning of 1960 and 20,000 per day by the end of 1961.

Nevertheless, these deposits are not easily exploited for it is a deep field with a bottom hole pressure of 670 kg. per sq. cm., a temperature of 140°C. and H_2S content of 15.2% and a CO_2 content of 9.6%. There is also the problem of transportation and, perhaps more important still, the question of storage. French experience in transporting gas from the Lorraine coking plants to Paris showed that the resultant storage problems could only be solved by underground storage.

Major Revolution

Although the anticipated expansion of the utilisation of gas from the Lacq deposits is described as 'a major revolution in the history of the French gas industry' this is not to say that other sources of gas will necessarily undergo a swift decline. In fact, it is expected that whereas production from the gas industry proper may fall slightly between now and 1965, there should be a slight increase in blast furnace gas and higher outputs from pithead and iron and steel coking plant. What is likely to happen, of course, is that the increasing use of natural gas in France will help to improve the country's energy balance sheet in general over the next few years.

Natural gas plays a much less important part in the Federal Republic of Germany where in 1956 oil products and natural gas accounted for no more than 1.7% of total mixed gas availabilities. A striking example of the efficient use which is made of coal as a secondary form of energy in the Federal Republic is shown by the fact that between 1936 and 1955, whereas mined coal increased by only 11.8%, the output of gas rose by 40.9% and coke by 33.5%.

In addition to natural gas (which is mainly used in transport, chemicals and the iron and steel industry) Germany's gas supplies are also derived from coking plants at mines and steelworks and from conventional gasworks. About 80% of the demand for gas is met from coking plant, where underfiring of ovens is an important factor.

A good example of a mixed gas economy is provided by the Netherlands where in 1956 about 30% of total gas available for public supply came from the country's 53 gasworks, 38% from the three coking plants, 13% from the Royal Dutch Shell refinery at Pernis, 7% from natural gas wells and the balance from imports.

Since the war there has been a steady growth in the concentration of coking plants and the rapid development of natural and refinery gases (since 1953). As a result, an extensive network of gas mains has been laid throughout the country so that already about 60% of total gas supply for public consumption is in the form of 'long distance' gas. It is anticipated that in the future, the concentration of gas production in the hands of large producers will continue and that less coal gas will be produced in gas works. Natural and refinery gases are likely to continue to increase.

Italy provides an example of a country where, even more than in the case of France, the discovery of supplies of natural gas led to a welcome improvement in the fuel position. Today, Italy's fuel gas requirements are met first and foremost, by natural gas (which supplied 9% of all national energy requirements in 1955), followed, in order of importance by coke oven gas, liquefied petroleum gas, gas from blast furnaces, gasworks and oil refineries.

Since 1946, the production of natural gas in Italy has increased more than fifty-fold. Up to the present, the main area of exploitation has been the Po Valley and the area supplied by the natural gas network is mainly restricted to this region although pipes carry supplies to Genoa and Florence.

Diversity of Supply

Another trend in the Italian gas industry is the increasing importance of liquefied petroleum gases which at present are mainly used for private consumption (when they are distributed in special cylinders) or for indirect consumption via gasworks where they are mixed with other gases.

From the country-by-country survey contained in the Report, it is clear that perhaps the most striking feature of gas in the O.E.E.C. area is the great diversity in methods of supply. Yet, whether gas is produced from coal in gasworks, as a by-product of metallurgical coke production, derived from natural gas sources, drained from coal mines in the form of methane or as a by-product in oil refineries, the Report makes it abundantly clear that gas is a very important form of energy whose wise exploitation and development are essential to a successful energy policy for the O.E.E.C. countries.

One feature of gas which is clearly brought out in the Report is the fact that it has ramifications in many other industries and yet, because gas supplies are a public service a gas indus-

try must ensure continuity of supplies, a standard quality of output and the service which goes with the sale of its products, no matter what may be happening in the industries with which its products are linked.

On the other hand, gas has the advantage of combining a high thermal conversion of coal into gas, coke and other by-products with a high efficiency in use. Furthermore, gas puts to good use necessary by-products from coke ovens and blast furnaces, coal mines and oil refineries which would either otherwise be allowed to go to waste or be used for purposes for which lower grade fuels can be used.

Despite these advantages, however, gas faces severe competition from other forms of energy and important though its virtues are in the context of the national energy situation in each country, it is by its final price to the consumer that its competitive value will be judged, taking into consideration its advantages as a fuel for various purposes.

Little attempt is made at accurate long-term forecasting in the Report, largely because of the complexity and number of the factors affecting demand and supply in the future. But although declining to advance any detailed recommendations about the future development of the gas sector in the O.E.E.C., the report does put forward one or two general aims which might well be pursued by those countries to which they apply.

Full Exploitation

These aims include the full exploitation of gas as a source of primary energy from natural gas wells and coal mines as well as the best use of gas produced as a by-product in the production of metallurgical coke and iron and steel and in oil refining processes.

It is also suggested that close attention should be paid to the development of long distance transmission and distribution to ensure that the advantages of exploiting all the newer sources of gas at the most advantageous locations (e.g., at coal mines, iron and steel works, oil refineries, etc.) will be reflected in the price at which gas shall be available in areas of heavy consumption, which may well be some considerable distance away from the source of most economical production.

Above all, there is a growing need for the intensification of research and development on the gasification by the gas industry proper of low grade coal and petroleum products in order that the industry in general shall be less dependent on traditional gas-making coals and the carbonisation process and so that it shall be able to adjust itself to a new situation, should the demand for coke fall.

With these recommendations there will no doubt be general agreement. All concerned with the gas industry will equally support the Report's general conclusion which states that: 'It is clear that the maximum possible co-ordination of all the sources of gas would have many advantages. The benefits of increased diversity of consumption would be coupled with the optimum use of natural gas, by-product gases and manufactured gas and of the production, storage, transmission and distribution equipment on which much capital has been and is being spent.'

Clean Air Conference and Exhibition at Llandudno Next Month

THE National Society for Clean Air is to hold its annual conference at Llandudno from October 1 to 3. A new feature this year will be a Clean Air Exhibition.

Two of the main speakers will be the Minister of Housing and Local Government and Welsh Affairs, Mr. Henry Brooke, and Sir William Holford, Professor of Town Planning, University College, London. The Minister will speak during the first session of the conference, and Sir William is to give the Des Voeux Memorial Lecture on 'Clean Air, Urban Amenity and the Growth of Towns.'

The conference, which will be attended by over 750 members and delegates—a record number—will hear a Presidential Address by Dr. R. Lessing, entitled, 'Clean Air on the Way.'

The programme for the three middle sessions of the conference will be devoted to papers and discussions on the following subjects:—

Industrial aspects of the Clean Air Act. In this session papers will be read by G. W. Farquharson, Chief Smoke Inspector, Birmingham, on 'The Control of Dark Smoke Emissions'; by T. M. Ashford, Senior Smoke Inspector, Glasgow, on 'The Control of Grit and Dust'; and by N. Bastable, Chief Public Health Inspector, Barking, on 'The Height of Chimneys.'

Forum on smoke control areas. This will consist of a review of reports from the Society's divisions, by Dr. Llywelyn Roberts, Medical Officer of Health for Sheffield. There will be an open discussion on the reports, and a representative panel will answer questions.

General technical session. This will contain papers on 'Air Pollution in and around London's Smokeless Zone,' by T. S. Pindard and Dr. E. T. Wilkins; 'Atmospheric Pollution and Respiratory Disease,' by Dr. D. D. Reid; 'Hazards from Airborne Radioactive Matter,' by G. B. Courtier, and 'An Automatic Smokeless Stoker for Central Heating,' by D. V. Brooke and Dr. S. A. Burke.

The conferences of the N.S.C.A. and its forerunner, the National Smoke Abatement Society, are of especial value as a meeting place for all those concerned with the conquest of air pollution—including members of local authorities, government departments, industrial concerns, medical, scientific and technical bodies, and private individuals. The value of the conference is increased this year by the exhibition, which will show the latest methods for the prevention of smoke and other pollution—from dust collectors for power stations and mechanical stokers for industrial boilers, to smokeless fuels and better grates for the home.

WORLD POWER—*From p.563*

this section, by J. E. Davis, Chief Technical Officer, and C. Ryder, Central Laboratories Chemist, South Eastern Gas Board (published on p. 571). The other 'home grown' paper occurred under the Utilisation banner and stemmed from the North Thames Gas Board. The authors were S. G. Aberdein, Commercial Manager, and A. E. Tyrrell, Deputy Divisional Manager. Most unfortunately, the former did not attend the conference.

We would have liked to see the British gas industry more strongly represented, and not necessarily only among the authors of technical papers. Surely this conference is sufficiently important for the Gas Council to be represented? However, if the gas industry as such was poorly represented, it was pleasant to see the familiar figure of Sir Harold Hartley on the platform. Four score years young, Sir Harold is of course not only Honorary President of the World Power Conference, but on this occasion was also the official representative of H.M. Government.

We shall be reviewing all those technical sections of direct or indirect interest to the gas industry in later issues.

At the World Power Conference in Montreal

THE EFFECTIVE USE OF FUEL RESOURCES THROUGH GASIFICATION

By

J. E. DAVIS, O.B.E., F.R.I.C., M.Inst.Gas E., F.Inst.F.,
Chief Technical Officer, South Eastern Gas Board.

and

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Chemical Department, South Eastern Gas Board.

ALTHOUGH the World Power Conference has now attained the respectable age of one-third of a century, it is only within comparatively recent years that the importance of the objectives defined at its inaugural meeting has been generally recognised, and a fair measure of its first objective attained. This first objective was the assessment of the fuel and energy demands of the world and of the resources available for meeting those demands. The second objective of guiding the most economic development and application of energy demands for their respective uses is a task upon which much more effort has yet to be expended. Yet without it the information collected so far cannot be put to its best use.

While there have long been a few people, and among them we must count the founders of the Conference, who have understood that fuel and power form one of the indispensable bases of a technological society, it has taken the actual experience of fuel shortages in the post-war years to teach the lesson more widely. Not only to those countries with a highly developed technology is an adequate energy supply of fundamental importance, but, as the sectional meeting of 1957 showed, the matter is one of literally vital concern to under-developed areas.

Greater Demands

The several assessments which have been made of future energy demands, whatever their absolute accuracy, have shown that the need and potential usage is far greater than had been supposed before these studies were made. Similarly, the estimates of resources have exposed an alarming deficiency in relation to future needs. The release and practical employment of nuclear energy has come none too soon. The purpose of this paper is not to elaborate upon the considerations of total fuel available and required, but rather to turn the attention of the Conference towards the aspect of form as contrasted with quantity. The O.E.E.C. report on future energy supplies for Europe rendered a great service to the co-operating nations in defining the rate at which the several sources would need to be developed.

The investment needed to follow such a programme is enormous, and that part of the investment which relates to opening up new sources is inescapable if technological development is to continue. The form in which these sources are to be made available to the user can, however, have a major influence on the total capital investment involved and the extent to which the development of sources must proceed. The form of fuel supply is important for this reason, but it is important also because technical advances and a rising standard of living produce a change in the reaction of the consumer to the form of his fuel supplies.

Location of Fuel

Traditionally, the less highly industrialised communities have tended to use such scant resources of fuel as are available to them in the locality in which they live, and these have served well enough for simple needs. Industrial development has often chosen its site for reasons of local availability of coal deposits. Modern industry is, however, unwilling to sacrifice other advantages and other considerations in choosing the scene of operations and demands that the fuel shall be available at the point which it chooses on other grounds. While energy is a primary necessity for industry, it is no longer allowed to determine the layout of factory processes any more than it may determine the factory site.

The labour employed in industry is required for essential manufacturing operations and, except in those special industries where fuel is a major raw material, operations leading to the provision of energy for the factory are a distraction from the main task. Similar considerations influence domestic and commercial users of fuel. Energy supply is required to be a service provided and paid for rather than a task which they themselves perform. The pattern of growing demands in Europe, as well as in the American continent, is selective, calling more and more for energy in convenient form and no longer simply for energy at low prime cost.

This development has perhaps reached its clearest expression in the U.S.A. with its enormous resources of fuel and its highly industrialised communities spread over the continent. Half the fuel requirements are met by petroleum, a quarter by natural gas, and the remaining quarter by coal, and yet this is far from being the

same order as the magnitude of the several sources. Coal is the most plentiful source and yet relatively least in demand. In Europe also, wherever natural gas is available, its use in preference to coal is apparent. Even in countries without indigenous oil resources petroleum imports are growing not only to provide the specialised transport fuels but also to provide fuels more convenient in use than the coal which the countries themselves possess. While this paper does not deal with the specialised forms of fuel required for modern transport, it has been in this field that the trend towards more highly refined forms has first become apparent.

The United Kingdom, since the end of the war, has faced what appeared an absolute deficiency in available coal, but the nature of the deficiency is now seen to be changing, and small coal is available but not in demand. A dominant feature of fuel and energy supplies in all countries is the rapidly growing demand for electrical energy. Not only for purposes of power and light, where it is indispensable, but also as a means of replacing fuel in less convenient form, and this notwithstanding the higher cost of the energy unit of electricity as compared with solid fuel. The trend is clear and the problem now, and more urgently in the future, is not solely one of supplying enough fuel but even more one of supplying fuel in an acceptable form, and doing this with sufficient speed and without a crippling rate of capital investment.

The nature of developing demand both as regards quantity and form imposes on the fuel and power industries the pattern of a public service in which the whole series of functions and responsibilities from source to user are co-ordinated. With such a view it becomes possible to consider the several functions, not as a number of unrelated acts, but as a series of co-ordinated steps, attributing to each function its appropriate economic value and so producing a pattern of energy supplies making the minimum demand on available resources of capital, materials and labour.

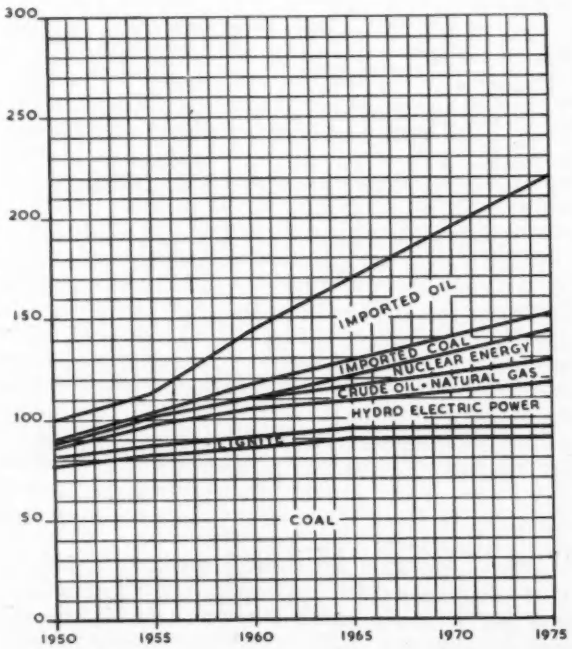

Fig 1.—Probable trends of Europe's primary energy demands based on coal equivalents (year 1950 = 100).

For such a service to be successful it must show a high versatility in using available energy sources, and the recognition of this basic requirement is apt to lead to the view that the simplest solution may be to convert all energy sources into electrical energy and make this the sole form of supply. Indeed, it is simple as a concept, but it by no means follows that economically it is the best answer.

The time is now opportune for reviewing the economic implications of the several functions involved in a public energy supply service because we are as yet only at the beginning of its development. The term 'public energy supply,' in the sense considered here, does not cover the provision of the specialised transport fuels or fuels used as raw materials in the chemical industries. It is greatly to be regretted that reliable numerical values of economic factors are hard to come by. Prices themselves are an unreliable guide for they are often confused by short term commercial considerations. Recorded costs, that is to say, costs of things already done, are more useful, but not sufficient in themselves to form the basis of future planning.

Opportunity to Help

Costs may be changed by performing an essential operation in a different way and the main value of recorded costs lies in their power of illuminating the deficiencies of past performance. Attempts to give numerical values to the economic factors of the several functions are avoided in this paper, because dispute over their accuracy could easily divert attention from the main theme.

It is one of the two major objects of this paper to suggest that the World Power Conference could do an invaluable service to all fuel users by initiating an impartial study of the cost-causing factors of each of the functions involved in a public energy service, thereby bringing together the factual information which could guide an informed and balanced development. Fig. III shows, in perhaps over-simplified form, the functions which are involved in relation to sources and media. It indicates which functions are involved under the several headings and although the separation is not always sharp it does focus the points requiring study.

Sources shown are coal, which is intended to cover the numerous varieties of solid fossil fuel; oil, liquid form of fossil fuel; and natural gas, its gaseous counterpart. The new source, nuclear energy, has a place of its own. The sources derived from current solar energy —wind, water, and direct solar heat—have not been included in Fig. III owing to the diverse forms in which they are ultimately used. Electricity and manufactured gas are not sources but media. The cost-causing factors in this function are exploration, capital investment in the works necessary to make the source available, and current expenditure in the extractive operation.

In the function transport, are included all those acts and associated costs involved in moving the source in its naturally occurring form from its point of origin to the point where the next appropriate function occurs. Natural gas would not normally be expected to involve this function, but the proposals to convey it liquefied at low temperatures to places remote from its point of

origin requires that it should receive consideration under this head. More commonly the movement of natural gas from its point of origin to its point of use would be considered under the function of transmission. The widely differing costs of transport over land and over water require that the economics of this function are studied in relation to the geography of the terminal points and the consequent location of conversion plant.

The function, conversion, is intended to cover all those operations which transform the energy of the source into the medium of supply. Conversion processes fall into two groups, each having their special characteristics. One group may be classified as chemical conversion covering the operations of gas manufacturing works and oil refineries, gas manufacture effecting the more drastic change, but both of them being conducted with high thermal efficiency. Mechanical conversion involves first the conversion of the energy of the source into mechanical energy and then the transformation of that into electrical energy. This may be an operation of high thermal efficiency, as in the conversion of water power, but is necessarily of low efficiency if the source has first to be converted to heat. Natural gas does not normally need conversion for it is in itself both source and medium.

Transmission is a function which concerns media only, but it has special significance in that it can do so much to avoid high transport costs if the point of conversion is chosen appropriately. It enables the energy service to be given to users ill-situated with regard either to the source or to a convenient transport terminal.

The fact that energy demands are not maintained at a continuous level night and day and throughout the seasons makes energy storage a vital function in the economic provision of a public energy service. Those sources and media in which the energy is contained as potential chemical energy are the only ones capable of storage to any large extent. Modern developments in electrical equipment, whereby heat derived from electrical energy can be stored on a consumer's premises, serve to give some measure of short-period storage, but this is only a small part of the total problem, and a study of the economic factors of this function requires a distinction between short-period storage and long-period storage.

Smoothing the Supply

Short-period storage can serve to avoid hour-by-hour fluctuations in the operation of conversion and transmission, but the problem of storage to cover fluctuations in seasonal demand is one of far greater difficulty. It is this factor more than any other which weighs in favour of the continuing use of solid fuel, the theory being that it can be stored on the user's premises, thereby avoiding peak demands upon any of the several functions of the energy service. In practice this is becoming increasingly difficult to achieve, because the user is not only less willing to use fuel in this form, but also coming to understand the cost which he incurs in providing the storage facilities. The economic factors in this function include the not inconsiderable costs of putting into and recovering from store, which, particularly in the case of solid fuel, involves the installation of reclaiming machinery working for only short periods at full load.

Distribution is a function covering the operation from the point of storage, if there is one, if not, from the end of the transmission system, to the user's premises. Unfortunately, the term—and hence the cost records—is often used to cover a substantial element of consumer service and commercial functions, such as meter reading and rendering accounts. It is, therefore, particularly difficult to disentangle from these records the true cost of physical distribution. In the case of the two media which commonly constitute the means of giving a public energy service, the initial cost of giving a supply is high, but the incremental cost of giving an increased supply to an individual user falls with increasing usage, particularly rapidly in the case of gas. An important objective of any study of the economic factors of distribution should be the attainment of the best possible use of the investment in distribution systems.

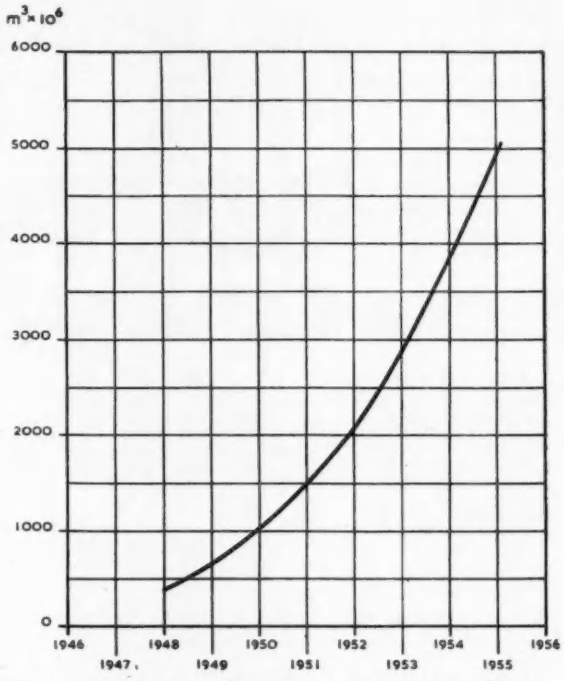

Fig. 2.—Production of natural gas in Western Europe.

At the end of the chain of functions involved in the public energy service comes that of utilisation, which, although within the control of the user to some extent is also determined in effectiveness and efficiency by the form of the medium and the design of the equipment which he uses. The advantage in both these respects lies with the more convenient media because they can be more precisely controlled for the purpose in question, and electrical energy in particular can be applied to its specific function with high efficiency. For services which require the energy in the form of heat, modern gas equipment can give performance in which the output/input ratio lags little behind that of electrical equipment.

In those countries which are fortunate enough to possess large supplies of natural gas there can be little doubt about its rapidly extending use both as a source and a medium. What is less clear is the part to be played in the future by manufactured gas which has to be derived from a source or sources and employed because of its intrinsic advantages as a medium of energy supply. This is a matter which has received

FUNCTION \ FORM	COAL	OIL	NATURAL GAS	MANUFACTURED GAS	ELECTRICITY	NUCLEAR ENERGY
SOURCE	●	●	●			●
TRANSPORT	●	●	○			
HANDLING	●					
CONVERSION		●		●	●	
TRANSMISSION			●	●	●	
STORAGE	●	●	●	●		
DISTRIBUTION	●	●	●	●	●	
HANDLING	●	●				
UTILISATION	●	●	●	●	●	
HANDLING	●					

(a) THE FUNCTIONS APPLICABLE ARE INDICATED THUS ●
(b) THE TRANSPORT FUNCTION IS APPLICABLE TO LIQUEFIED NATURAL GAS ○

Fig. 3.—The functions involved in providing a public energy service.

intensive study in recent years, particularly in the United Kingdom, which finds itself in a somewhat special position.

As a highly developed technological society whose industrial activities sprang from the ready availability of ample supplies of coal, it finds that these supplies no longer seem ample in the light of the demands being made upon them. Extensive exploration has revealed no substantial supplies of either oil or natural gas, and imported petroleum has proved a valuable, indeed the only possible, means of increasing the total available energy with the speed which the recent growth in energy uses has demanded. It is these circumstances which have given the special urgency to the development and practical application of nuclear energy and compelled the enormous investment which is now being made in nuclear power stations and the supply of that energy through the medium of electricity.

All this is necessary and urgent, and the only way of meeting the mounting demands for energy as power. Even so, it is questionable whether the development of the new source can proceed fast enough to keep up with increasing total demands. In addition to this great task there is the further requirement to replace energy required for heat, and now obtained in the less convenient and less acceptable forms, by energy distributed through a more acceptable medium.

It has become necessary to recognise that gas supply is not a unique operation but that its functions and the economic factors of those functions require to be considered and compared alongside similar functions for other systems, thereby showing in what way manufactured gas can make its special contribution to the public energy service. When this is done valuable economic features are recognised and a logical line of development revealed, leading to a manufactured gas industry hardly recognisable as a derivative of the former parochial service. Although manufactured gas does not show the same universal ability as electricity to convert all sources of energy, it certainly can employ any of the fossil fuels and potentially any form of heat.

Transport costs can be eliminated or reduced by erecting the conversion plant as close as possible to the source, but where transport costs must necessarily be incurred they are less for gas than for electricity because of the smaller weight of material to be transported per unit of energy sent out. The economics of conversion are favourable to manufactured gas because of the high thermal efficiency with which this operation can be carried out. Depending on the nature of the source and the process employed, from 70%-80% of the potential energy from the source can appear in the product gas.

Transmission costs vary widely according to circumstances. The movement of large volumes is cheap, and especially so if the gas is transmitted under high pressure. If gas is produced at atmospheric pressure and subsequently compressed power costs are high and it is this fact among others which has led to growing interest in pressure gasification processes. Where these are employed and the scale of operation is sufficient, transmission costs of energy in the form of gas do not exceed one-quarter of the costs of transmitting an equal quantity of energy through the medium of electricity. This comparison is made at a calorific value of 500 B.t.u. per cu.ft. and becomes more favourable the higher the calorific value.

The gaseous medium of supply has the merit of being storable, although the importance of this factor can be misinterpreted. Normally storage in low pressure gasholders is not intended to do more than level out the variations in rate of usage over the 24 hours, thereby giving to conversion plant and transmission mains a level load. There is, however, a wide variety of methods by which the effects of longer term storage can be obtained.

Where geological formations permit, gas may be stored in natural porous strata below ground, and important developments of this nature are taking place in several parts of Europe, copying a well established practice of the American gas industry. In Great Britain one interesting project aims to create an artificial underground cavity by dissolving the salt from a salt dome. Such gifts of nature are not always in evidence and since the cheapest way to store potential energy is in the form of a combustible liquid, the current trend is to retain against peak demands petroleum products which can be stored as a liquid and speedily converted to gas in plant of low capital cost.

An interesting development of considerable potential value derives from pressure gasification processes which, at some stage of the process, employ the mixture of carbon monoxide and hydrogen, known as synthesis gas. As an alternative to proceeding direct to the conversion of this mixture to town gas, it may be converted to methanol during the season of low demand. The stored methanol has been shown to be capable of simple and rapid conversion to town gas, supplementing current production at the season of heavy demand.

Distribution costs are mainly the result of capital investment, and here the gaseous medium shows a

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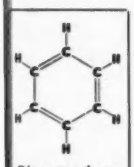
IF you were a chemist you'd know that Aromatics is the name given to a particular family of hydrocarbons, of which benzene is the parent. Benzene forms about 80% of the Aromatics in motor benzole, the remainder being xylene and toluene. Super National Benzole Mixture is a scientific blend of motor benzole and high-octane petrol, which itself contains Aromatics. As a chemist you'd know, then, that Super National Benzole is highly Aromatic, and this would interest you considerably. But as a motorist it would interest you even more. Because the Aromatics in Super National Benzole make a whole world of difference to the performance of your car.



Diagrams shows compact chemical structure of benzene.

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Motor benzole has a higher calorific value (more energy) per gallon than ordinary petrol. This is because Aromatics are more *compact* than other hydrocarbons. With Super National Benzole in your tank you get more miles for your money.

AROMATICS PREVENT KNOCKING

Owing to their compact structure, Aromatics are extremely resistant to knock even at high-compression ratios.

This is one of the reasons why Super National Benzole is particularly valuable for modern cars. High-compression engines *need* the anti-knock resistance of Aromatics. And Super National Benzole contains more Aromatics than any other Super-grade fuel.

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The Aromatics in motor benzole are exceptionally volatile. They vaporise readily even when your engine's cold. So your engine reaches top performance in the shortest possible time.

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Because Aromatics are so valuable, most modern motor fuels contain a certain amount of them. Manufacturers, in fact, spend a good deal of money producing Aromatics for petrol. These Aromatics are mainly distinguished from those in benzole by the fact that they boil at higher temperatures. So, while Aromatics in general are not exclusive, the light, low-boiling Aromatics that are found in motor benzole *are*. It is these Aromatics that contribute so much to better motoring, giving quicker starting, quicker warm-up, high knock resistance and more miles per gallon —*the Benzole Bonus*, in fact.

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For high-Aromatic motoring

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requirement perhaps one-fifth as great as the electrical investment, provided that the distribution investment is adequately used. In current practice it is probably loaded to little more than one-tenth of its potential carrying capacity. With adequate use of the distribution system the costs of this function per unit of energy supplied can fall well below those for coal or oil.

Clearly, the economic advantages of manufactured gas as a medium for the operation of a public energy service cannot be neglected in any serious attempt to give that service at minimum cost, and current technical developments are directed towards taking the maximum advantage of each of these inherent features. Mainly this must lie through the extended employment of gasification methods, both proved and currently under development. But this is not to ignore the important part still to be played by coal carbonisation.

Coke Production

As an aid to clear thinking on the relative merits of carbonisation and gasification, it is helpful to remember that carbonisation is essentially a process of coke production. Two-thirds of the energy of the original coal appears in the form of coke, and by far the greater part of the capital charge for the plant is associated with the handling, heating and cooling of solid material, either coal or coke. Nevertheless, where there is a real need for coke and suitable coal is available, there is still no cheaper way of producing gaseous fuel.

It does require, however, that the coke should be in demand and should command a price ex-works not less than 1.25 times, and preferably nearer 1.5 times the price paid per ton of coal. If coke revenue falls below this level, gasification is to be preferred to carbonisation. The capital cost of carbonising plant is high, but if the market for coke is such that two-thirds of this cost is carried by the coke, that is to say, a proportion appropriate to the relative thermal values of coke and gas, the incidence of these charges on the cost of a therm of gas is no higher than if that therm were produced in gasification plant.

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Over a shorter term there is a large and important market for coke in the United Kingdom to replace large coal now used in domestic heating appliances. This is one of the outstanding instances where fuel shortages have been a matter of form rather than total tonnage. Coal shortage is now seen to be more a matter of shortage of large coal than shortage of small coal. Moreover, the adoption by the British Government of a clean air policy is creating an increasing demand for coke as a domestic fuel in replacement of coal until such time as the more highly refined media of gas and electricity can complete its replacement.

The flexibility of carbonising plant can be increased within limits by altering the type of gas used for heating the carbonising plant. The thermal value of the gas required for underfiring is between 40% and 50% of the total gas produced by carbonisation. When the demand for gas is low this proportion of the total gas may be so used and at times of high demand may be released for distribution by using a gasification gas in its place. It is undesirable for this gasification gas to be made from coke because this is the prime product of carbonisation and as such is too costly to employ for this purpose. Hence the growing interest in methods for the gasification of small coal of high ash content and of a type not suitable for coke production.

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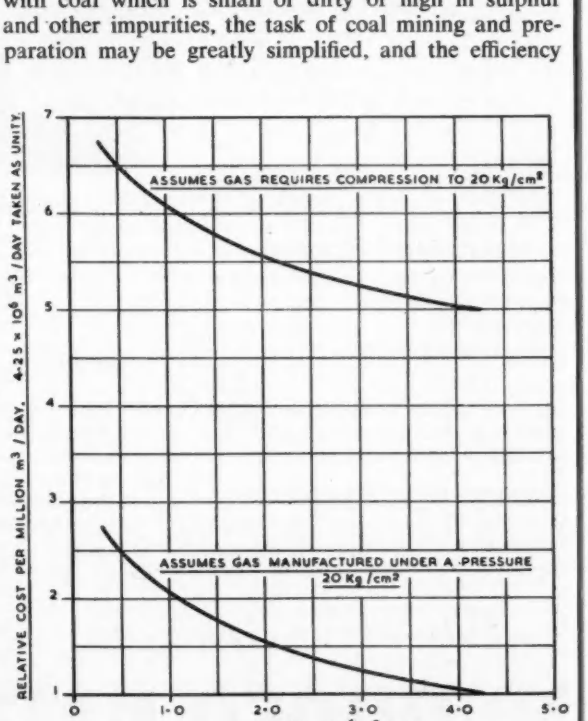


Fig. 4.—Transmission of gas under pressure. Influence of capacity of pipeline on transmission costs.

with which this source can be used become magnified. More immediately, gasification processes are being applied to the easier problem of converting petroleum products.

Oil gasification has been employed for many years through the medium of the familiar carburetted water gas process. It may be an unorthodox view to regard this as an oil gasification process because half of the thermal value of the gas is derived from coke and half from oil. But it is the oil half which possesses the advantages. A water gas plant producing the coke element alone is cheap neither in capital cost nor in raw materials consumed per therm of gas made. The advantages of flexibility and high output per unit of capital investment are obtained only through the gasification of oil by pyrolysis in the carburettor.

Using the same plant but with a different method of operation, and employing suitable petroleum distillates, the advantage can be extended. Pyrolysis within the generator fuel bed is added to pyrolysis in the carburettor, thereby increasing the thermal output of the unit of plant by some 25%-30% and reducing the proportion of coke gas from 50% to 25%. While this is an excellent use of existing plant, it is only one step in the direction of gasification of petroleum products alone. In recent years a wide variety of such processes has been devised, some producing a gas of chemical and physical characteristics approximating to those of coal gas, others producing a gas comparable in properties with natural gas, and yet others producing gas whose characteristics are so widely different as to limit the proportion in which it can be used.

All these processes are characterised by high thermal efficiencies and low capital investment per unit of gas output. Their first use has been to fulfil one of the stated requirements of gasification processes, namely to improve flexibility of gas production when used in association with carbonising plant, but there are now in operation in the United Kingdom two large conversion units based solely upon petroleum products and operating independently of coal carbonisation, although gas produced by them is fed into a grid which also contains coal gas. In each of these cases the plants are receiving from oil refineries petroleum products which it would otherwise be difficult to market efficiently. In one case the product is refinery gas. In the other the product may from time to time be any of a wide range of materials which happens to be out of balance in the general petroleum market.

Liquid Methane

In more than one sense the novel project of importing natural gas in liquefied form may be classed with the developments of oil gasification because it is intended to make use of a source which is otherwise unmarketable, and indeed blown to waste, and invokes the functions of transport and conversion to bring this material to the point where it can supplement gas supplies derived from coal carbonisation or gasification and oil gasification.

The next stage in the development of oil gasification is now seen to be the employment of pressure and the separation of reactions which now proceed simultaneously. The reactions involved in oil gasification may be grouped in the two categories of hydrocarbon pyrolysis and gasification of carbon with steam. The first reaction contributes the high calorific value components to the mixture and the second, which is necessary to provide the higher hydrogen/carbon ratio of town gas compared with that of petroleum, contributes the components of lower calorific value. For optimum performance the two groups of reactions require to be conducted at different temperatures. Pyrolysis for gas production is best carried out in the temperature range 700°C.-900°C., while the reaction between carbon and steam demands temperatures above 1,000°C. The separation of the two groups of reactions into separate plant units, one producing the high calorific value gas and the other the low calorific value gas, not only permits these optimum conditions of temperature to be maintained, but also provides a hitherto unrealised facility for accurate control of gas quality.

Synthesis Gas

In one such scheme a portion of the petroleum feedstock is partially oxidised under pressure with steam and oxygen, giving rise to the mixture of hydrogen and carbon monoxide, often known as synthesis gas. This may be used directly to form the low calorific value component, or it may be subjected to the water gas shift reaction, whereby the carbon monoxide is replaced by hydrogen. The high calorific value component may be made by operating plant originally designed for cyclic catalytic gasification under such conditions of loading and temperature that it yields a gas rich in hydrocarbons and having a calorific value of 1,000-1,100 B.t.u. per cu.ft. In another variant synthesis gas is produced in the manner already described and subjected to the water gas shift reaction. The gas, under high pressure, and containing some 90% of hydrogen, is used to gasify a further quantity of oil under a pressure of 20-25 atmospheres and at temperatures of around 800°C., the reaction being essentially one of hydrogenation of the heavier hydrocarbons to methane.

Oil gasification processes are playing an immediately useful part in conserving coal, in helping to make the best use of petroleum imports, of providing gaseous fuel at a competitive cost, and giving experience of these new techniques under particularly favourable conditions. But it is clear that the maximum advantage will be realised when these and similar techniques of pressure gasification can be extended to operate on coal. It is confidently expected that this extension will take place rapidly, thereby opening up a greatly extended sphere for the employment of the gaseous medium in energy supply.

These developments may be regarded as current and expanding over the next few years, but improvements upon them are already the subject of experiment. Basically, the gasification of fossil fuels, whether solid or liquid, involves the breaking up of the molecule of water to yield hydrogen, and the removal from the sphere of operations of the oxygen with which it was combined. Normally this is done by causing carbon to act as the acceptor atom for the oxygen. The resultant carbon monoxide may be allowed to remain in the finished product, or may be caused to remove a further atom of oxygen from a further molecule of water and so provide a further molecule of hydrogen before it is rejected from the system as carbon dioxide.

In the conventional water gas process the carbon monoxide remains in the gas. But some carbon is also

rejected as carbon dioxide in order to provide the heat of the endothermic reaction between water and carbon. The introduction of atmospheric oxygen alone with its accompanying nitrogen for this second purpose is costly in occupying valuable reaction space and time within the plant and also through the heat losses which occur when the unwanted nitrogen is rejected along with the carbon dioxide.

Modern pressure gasification processes effect some improvement in that the oxygen necessary to supply the endothermic heat of reaction is first separated from nitrogen, compressed and fed into the reaction vessel. This does, of course, involve the provision of costly air separation plant and the consumption of power for the operation of that plant. Nevertheless, it is an overall advantage both in the control of the process and to the economics of gas production.

There would be a still further economic gain if the use of oxygen could be avoided, and this can be achieved if heat can be applied cheaply and effectively by some method which does not involve the addition of oxygen to the reactants. One way of achieving this is already foreseen. The reaction under pressure between hydrogen and oil or coal with the production of methane is rapid and highly efficient thermally. It also provides carbon in gaseous form as methane without the addition of oxygen to the system. The carbon, in the form of methane, can be brought into reaction with water vapour, so acting in its customary role as an oxygen acceptor producing additional hydrogen for the hydrogasification reaction and in due course being rejected, along with its combined oxygen, as carbon dioxide.

Use of Nuclear Reactors

This reaction between methane and steam is, of course, highly endothermic, but the heat required for the endothermic reaction may be applied externally. Initially this will be done by surrounding the reaction vessel or tubes with a pressure combustion chamber. But how convenient it will be when progress is made in the design of nuclear reactors to enable them to work at the higher temperatures which efficient power station operation demands and when these can provide a cheap source of high temperature heat.

It is important to remember that the nuclear reactor is a source of heat, and while that heat may be used to provide mechanical energy for distribution through the electrical medium, there is no fundamental reason why that heat should not be absorbed by endothermic chemical reactions and thus converted by the more efficient path into a readily distributable form. The potential efficiency of gas production by some possible paths is illustrated by a few examples:—

In the first example oil is subjected to pressure hydrogasification, which proceeds essentially according to the reaction

$$2CH_2 + 2H_2 \leftarrow 2CH_4$$

One of the two volumes of methane goes into the product gas, the other reacts endothermally with steam essentially according to the reaction

$$CH_4 + 2H_2O \rightarrow CO_2 + 4H_2$$

Two of the four volumes of hydrogen are mixed with the methane from the first reaction to yield the final product gas, and the other two volumes are recycled to the hydrogasification process. If the heat for the second reaction were supplied by the combustion of oil, 100 heat units in the oil for gasification and heating would yield 80 heat units in gas. But if 20 units of nuclear heat were supplied for this purpose and 100 heat units of oil were gasified, the gas yield would be 117 heat units, which represents a very efficient use of both oil and nuclear heat.

This particular example requires that the nuclear heat should be available at a temperature of about 1,000°C. and for this we must wait a while. But nuclear heat at current temperature levels could be used in association with known methods of coal gasification, as is assumed in the second example. The Lurgi pressure gasification process, when gasifying coal containing 100 heat units, yields 92 heat units in gas and liquid products, but to operate the process consumes a further 26 heat units for the production of steam and power. The net result is that 100 heat units in the total coal used would yield 72.5 units of heat. By obtaining the heat for steam and power from a nuclear reactor, 100 heat units in coal would yield 92 heat units in gas and liquid products. A similar result would be obtainable from a two-stage gasification process for fine coal now in course of development.

Future Possibilities

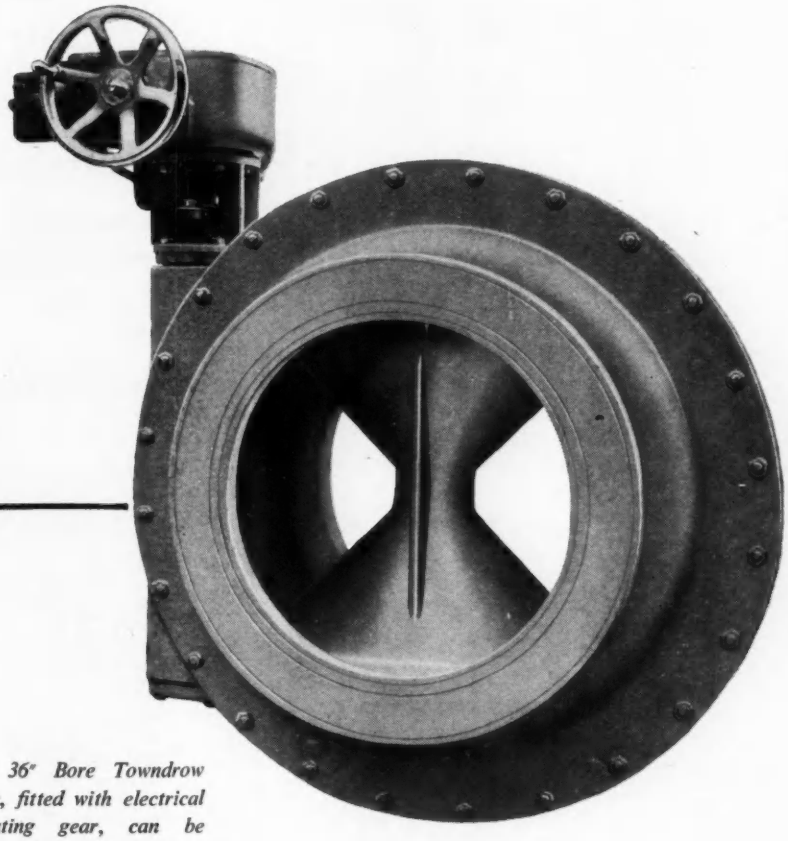
Such processes as these cannot yet be claimed as achievements but their possibility is not a remote one and they do serve to illustrate the versatility of the gaseous medium in its utilisation of sources, even to some extent the new source which is coming into use to supplement the older, failing sources. By such means the new, in partnership with the old, could materially extend the useful life of the old and avoid a waste that should never be condoned. Furthermore, the speedy practical realisation of the developments already in hand and of those projected for future research may well enable the public energy service to avoid the unnecessary expenditure of many thousands of millions of pounds of hard earned capital, sorely needed for providing for human welfare in other directions.

The economic advantages of the gaseous medium as a means of transmission, storage and distribution of energy, combined with the high conversion efficiency obtainable in gasification processes, indicate the continuing value of this means of rendering available fuel in convenient form.

Cathodic Protection

PUBLISHED by the Joint Committee for the Co-ordination of the Cathodic Protection of Buried Structures is a pamphlet entitled 'Cathodic Protection of Buried Structures.' Its purpose is to draw attention to the work of the Committee, and it describes the genesis and aims of that body, and records the progress made so far. The Committee is composed of representatives of the operators of all the major underground services in Britain, and it collaborates with the Department of Scientific and Industrial Research and several national research associations. The text is not intended to serve as a source of technical instruction in the application of cathodic protection, and the information given about practical methods has been included to illustrate matters of principle only.

Cort's Motorised Valves



This 36" Bore Towndrow Valve, fitted with electrical operating gear, can be opened or closed within 30 seconds, stopped in any position and sequence interlocked to other equipment.

CORTS *produce power operated valves from* $1\frac{1}{2}$ *inch to 36 inch bore, suitable for a wide variety of duties and conditions. The Towndrow valve illustrated has been specially designed to handle dirt laden gases. Double gate parallel slide valves are also produced in the same sizes.*

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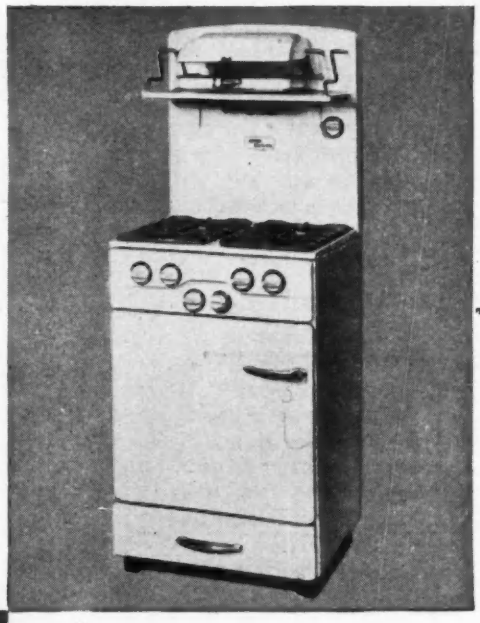
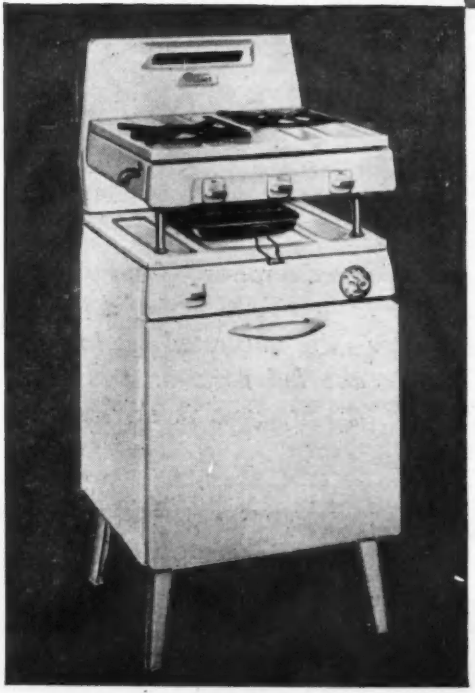
NEW leads





THE FORTY TWO

Eye-Level Grill, raised oven, storage drawer. Incorporates features which make it outstanding in its price range.

THE CADET

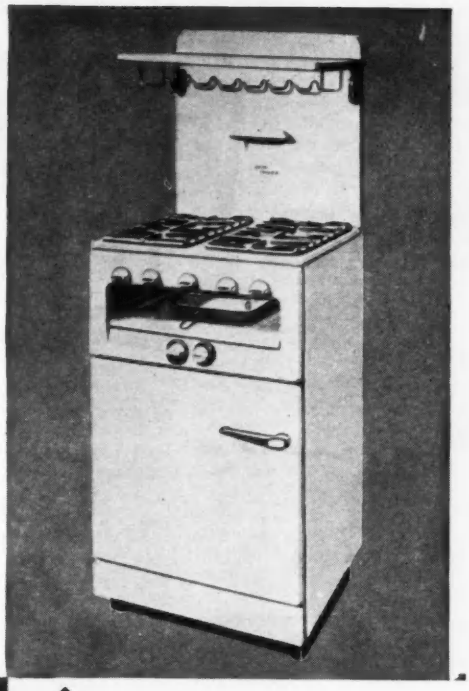
For the smaller household. With or without platerack, and with either short or long legs.

NEW WORLD
PRODUCT OF Radiation Ltd

WORLD

the way

with four outstanding cookers



THE FORTY ONE

A low price family cooker for the popular market.

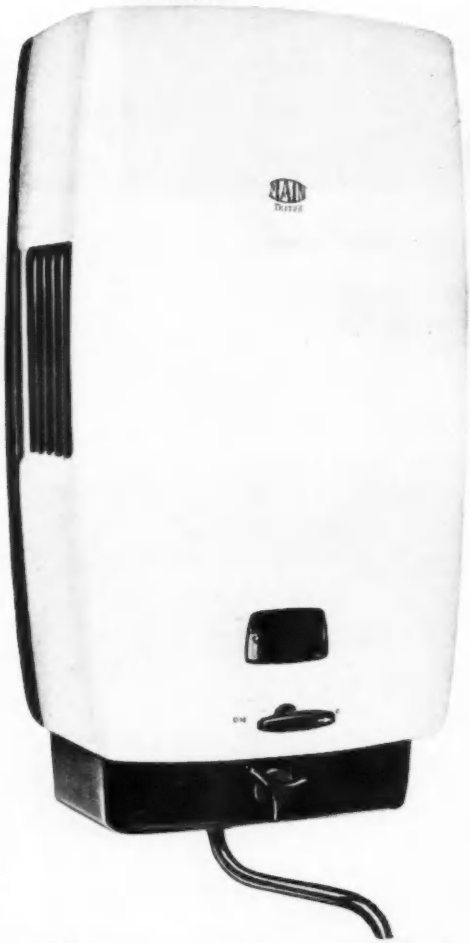
THE RANGETTE

Automatic hotplate ignition, folding Comfort-Level Grill, raised oven, warming chamber, storage compartment. Only 32½" wide.

leads the way

Bigger than ever National advertising campaign, with pages in full colour, started with the March issues of the leading Women's Weekly and Monthly Magazines.

the Triton is new!



—a completely new and elegantly styled instantaneous gas water heater

The 'Triton' will meet all the hot-water requirements of the average household, is available for single-point bath use, or with swivel spout as a dual-point to bath and basin, or in multi-point form for direct coupling to existing hot water supply pipes to serve kitchen sink and both bathroom points. The special features of the 'Triton' include—modern style and compact form permitting flush fitting and ease of maintenance — integral draught diverter incorporated within the casing — automatic valve and two-stage and easy ignition — vitreous enamel finish in choice of cream or white. Ask for full details—

it's modern, it's multipurpose, it's MAIN

MAIN WATER HEATERS LTD.
Gothic Works, Thornton Rd., Croydon, Surrey

Note the name - made by MAIN

W130

COMPANY MEETING

B.H.D. Engineers Limited

TURNOVER AND PROFITS WELL MAINTAINED

COMBATING COMPETITION BY INCREASING EFFICIENCY

MR. F. BRIAN HOLMES ON ENCOURAGING CURRENT TREND

THE tenth annual general meeting of B.H.D. Engineers, Limited, was held on September 10 at 10, Belgrave Square, London, S.W.1, Mr. F. Brian Holmes, M.INST.GAS.E. (the chairman) presiding.

The following is his report which has been circulated to shareholders:

The Profit on trading for the year as shown in the accounts amounts to £621,937, showing little change from the figure of the previous year, £622,412. Depreciation at £127,911 shows an increase of £17,250 as a result of the enlargement of manufacturing space for the Holset Engineering Co. and the installation of additional plant foreshadowed in my speech last year. It will be noted that the sum of £6,219 has been written off Patent Rights.

The Profit before tax amounts to £449,449 as against £472,146 in 1957. Taxation absorbs £254,498 as against £267,957, and after making adjustment for the interest of minority shareholders at £6,903, the Profit after tax is £188,048 compared with £197,598 in the preceding year.

Your Directors recommend a final ordinary dividend of 12½% making, with the Interim Dividend of 5% already paid, a total distribution of 17½% for the year, the same as last year.

The sum of £100,383 has been transferred to General Reserve in the accounts of Subsidiary Companies and a balance of £175,439 is carried forward to next year.

Balance Sheet Features

Turning to the Consolidated Balance Sheet, you will note that the Shareholders' interest, namely Share Capital and Reserves, has increased by £151,183 to £1,825,833. Among Current Liabilities, Bank overdrafts show a slight increase at £536,787, but this is more than offset by the increase in Cash at Bank and in Hand shown under Current Assets. A new item, Patent Rights, appears on the Asset side of the Balance Sheet at £35,000 after deducting the amount written-off during the year. It is intended to write off the balance of this sum over a period not exceeding 7 years.

In the Balance Sheet of the holding company, B.H.D. Engineers, Ltd., the only items calling for special comment are the changes in the amounts of shares in Subsidiary Companies (increased to £480,211) and in advances to Subsidiary Companies (reduced to £153,473). These alterations arise from the fact that the Issued Share Capital of one of the Subsidiary Companies was increased by £99,000 during the year which reduces correspondingly the indebtedness of the company in question to the holding company.

Extension of Production Facilities Completed

As I have indicated above, the extension of the Holset Engineering Company's production facilities has been completed, Prototypes of The Schwitzer Turbo-charger and non-bonded rubber Damper have been fully tested and as a result of the encouraging reception accorded these two new interesting lines of equipment by a number of engine builders we hope to be in quantity production before the end of the year.

I have in recent years found it necessary regularly to refer to the difficulty of obtaining our requirements of steel plate. I am glad to be able to report that there has, at last, been an improvement in the supply position which makes it no longer necessary for us to purchase continental plate at enhanced prices. I only hope the supply situation will not deteriorate again.

In order successfully to meet increasing competition and the tendency towards lower profit margins, your Directors are paying particular attention to the attainment of the highest degree of operating efficiency in each of the units in the Group. To assist them they are employing the services of a well-known firm of Management and Works Consultants with, so far, very satisfactory results.

Research and Development continue at high level and cover both the improvements of existing processes and plant and the investigation of new projects by which we may further widen the Group's interests.

Trading Conditions

The steps taken by the Government to halt inflation, including the postponement of Capital Expenditure by the nationalised industries, have naturally affected the Group. As a result, the value of orders received in the year under review was below that of the preceding year, but fortunately turnover was maintained due to the carry-over of work in hand from previous years. While in some respects this reduction in the back-log of orders is an advantage in that it permits better deliveries to be given which in turn has an important bearing on new business, had this continued much further it would have been a cause for serious anxiety. I am glad, however, to be able to report a more encouraging trend at the moment as a result of which the value of orders received to date this year is considerably in excess of that of the corresponding period in 1957.

Your Board is of the opinion that unless circumstances arise which are beyond our control and which affect our business adversely, the current year's results should compare favourably with those of the year covered by this Report.

Directors' Fees

It is becoming increasingly necessary for all your Directors to devote more of their time to the affairs of your Company and since there has been no change in the Directors' fees since the company was incorporated on January 19, 1949, it is now considered justifiable to ask the Shareholders to sanction an increase of fees for each Director from £200 per annum to £500 with an additional £500 per annum for the Chairman as set out in the Notice of the Extraordinary General Meeting to be held at the conclusion of the Annual General Meeting.

In conclusion I would like to pay sincere tribute to my colleagues on the Board, to the Executives of the various companies in the Group, to all our staff and employees for their help, efforts and loyalty which made such a vital contribution to the year's results.

The report and accounts were adopted and the dividend recommendation was approved.

The retiring directors, Mr. G. F. Chambers, M.A., and Mr. C. Cooper, M.SC., M.I.CHEM.E., M.INST.GAS E., having been re-elected the proceedings terminated.

At the subsequent extraordinary general meeting the proposed increase in Directors' Fees was sanctioned.

Sc.G.B. Approves £287,000 Projects

PROJECTS totalling £287,790 have been approved by the Scottish Gas Board during the past three months, it was reported at a recent meeting of the Scottish Gas Consultative Council in Edinburgh.

The biggest individual item is the Glasgow and Western Division's provision of £118,000 for the extension of a high pressure steel grid main from Cumbernauld to Coatbridge. This main will enable increased quantities of gas from the Lurgi plant at Westfield to be transmitted to Provan without the need for recompression at Coatbridge, thus resulting in a saving in running costs.

£600,000 Loan

The South Australian Gas Company is offering bonds bearing interest at £5 10s.% in respect of a £600,000 loan required to finance capital works associated with the expansion of the Company's undertakings.

requirement perhaps one-fifth as great as the electrical investment, provided that the distribution investment is adequately used. In current practice it is probably loaded to little more than one-tenth of its potential carrying capacity. With adequate use of the distribution system the costs of this function per unit of energy supplied can fall well below those for coal or oil.

Clearly, the economic advantages of manufactured gas as a medium for the operation of a public energy service cannot be neglected in any serious attempt to give that service at minimum cost, and current technical developments are directed towards taking the maximum advantage of each of these inherent features. Mainly this must lie through the extended employment of gasification methods, both proved and currently under development. But this is not to ignore the important part still to be played by coal carbonisation.

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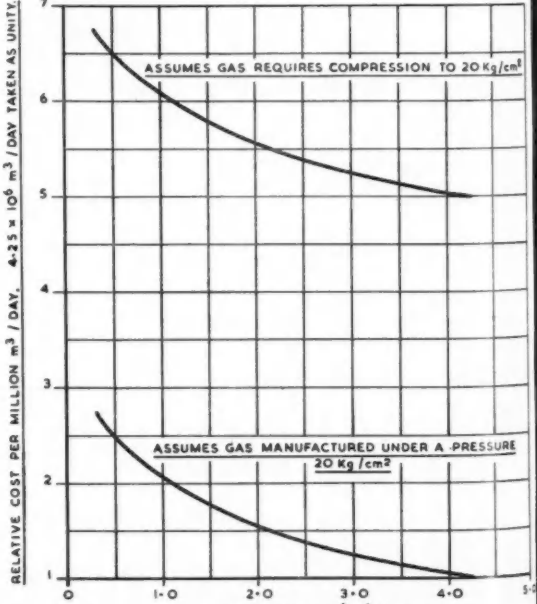

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Oil gasification has been employed for many years through the medium of the familiar carburetted water gas process. It may be an unorthodox view to regard this as an oil gasification process because half of the thermal value of the gas is derived from coke and half from oil. But it is the oil half which possesses the advantages. A water gas plant producing the coke element alone is cheap neither in capital cost nor in raw materials consumed per therm of gas made. The advantages of flexibility and high output per unit of capital investment are obtained only through the gasification of oil by pyrolysis in the carburettor.

Using the same plant but with a different method of operation, and employing suitable petroleum distillates, the advantage can be extended. Pyrolysis within the generator fuel bed is added to pyrolysis in the carburettor, thereby increasing the thermal output of the unit of plant by some 25%-30% and reducing the proportion of coke gas from 50% to 25%. While this is an excellent use of existing plant, it is only one step in the direction of gasification of petroleum products alone. In recent years a wide variety of such processes has been devised, some producing a gas of chemical and physical characteristics approximating to those of coal gas, others producing a gas comparable in properties with natural gas, and yet others producing gas whose characteristics are so widely different as to limit the proportion in which it can be used.

All these processes are characterised by high thermal efficiencies and low capital investment per unit of gas output. Their first use has been to fulfil one of the stated requirements of gasification processes, namely to improve flexibility of gas production when used in association with carbonising plant, but there are now in operation in the United Kingdom two large conversion units based solely upon petroleum products and operating independently of coal carbonisation, although gas produced by them is fed into a grid which also contains coal gas. In each of these cases the plants are receiving from oil refineries petroleum products which it would otherwise be difficult to market efficiently. In one case the product is refinery gas. In the other the product may from time to time be any of a wide range of materials which happens to be out of balance in the general petroleum market.

Liquid Methane

In more than one sense the novel project of importing natural gas in liquefied form may be classed with the developments of oil gasification because it is intended to make use of a source which is otherwise unmarketable, and indeed blown to waste, and invokes the functions of transport and conversion to bring this material to the point where it can supplement gas supplies derived from coal carbonisation or gasification and oil gasification.

The next stage in the development of oil gasification is now seen to be the employment of pressure and the separation of reactions which now proceed simultaneously. The reactions involved in oil gasification may be grouped in the two categories of hydrocarbon pyrolysis and gasification of carbon with steam. The first reaction contributes the high calorific value components to the mixture and the second, which is necessary to provide the higher hydrogen/carbon ratio of town gas compared with that of petroleum, contributes the components of lower calorific value. For optimum performance the two groups of reactions require to be conducted at different temperatures. Pyrolysis for gas production is best carried out in the temperature range 700°C.-900°C., while the reaction between carbon and steam demands temperatures above 1,000°C. The separation of the two groups of reactions into separate plant units, one producing the high calorific value gas and the other the low calorific value gas, not only permits these optimum conditions of temperature to be maintained, but also provides a hitherto unrealised facility for accurate control of gas quality.

Synthesis Gas

In one such scheme a portion of the petroleum feedstock is partially oxidised under pressure with steam and oxygen, giving rise to the mixture of hydrogen and carbon monoxide, often known as synthesis gas. This may be used directly to form the low calorific value component, or it may be subjected to the water gas shift reaction, whereby the carbon monoxide is replaced by hydrogen. The high calorific value component may be made by operating plant originally designed for cyclic catalytic gasification under such conditions of loading and temperature that it yields a gas rich in hydrocarbons and having a calorific value of 1,000-1,100 B.t.u. per cu.ft. In another variant synthesis gas is produced in the manner already described and subjected to the water gas shift reaction. The gas, under high pressure, and containing some 90% of hydrogen, is used to gasify a further quantity of oil under a pressure of 20-25 atmospheres and at temperatures of around 800°C., the reaction being essentially one of hydrogenation of the heavier hydrocarbons to methane.

Oil gasification processes are playing an immediately useful part in conserving coal, in helping to make the best use of petroleum imports, of providing gaseous fuel at a competitive cost, and giving experience of these new techniques under particularly favourable conditions. But it is clear that the maximum advantage will be realised when these and similar techniques of pressure gasification can be extended to operate on coal. It is confidently expected that this extension will take place rapidly, thereby opening up a greatly extended sphere for the employment of the gaseous medium in energy supply.

These developments may be regarded as current and expanding over the next few years, but improvements upon them are already the subject of experiment. Basically, the gasification of fossil fuels, whether solid or liquid, involves the breaking up of the molecule of water to yield hydrogen, and the removal from the sphere of operations of the oxygen with which it was combined. Normally this is done by causing carbon to act as the acceptor atom for the oxygen. The resultant carbon monoxide may be allowed to remain in the finished product, or may be caused to remove a further atom of oxygen from a further molecule of water and so provide a further molecule of hydrogen before it is rejected from the system as carbon dioxide.

In the conventional water gas process the carbon monoxide remains in the gas. But some carbon is also

rejected as carbon dioxide in order to provide the heat of the endothermic reaction between water and carbon. The introduction of atmospheric oxygen alone with its accompanying nitrogen for this second purpose is costly in occupying valuable reaction space and time within the plant and also through the heat losses which occur when the unwanted nitrogen is rejected along with the carbon dioxide.

Modern pressure gasification processes effect some improvement in that the oxygen necessary to supply the endothermic heat of reaction is first separated from nitrogen, compressed and fed into the reaction vessel. This does, of course, involve the provision of costly air separation plant and the consumption of power for the operation of that plant. Nevertheless, it is an overall advantage both in the control of the process and to the economics of gas production.

There would be a still further economic gain if the use of oxygen could be avoided, and this can be achieved if heat can be applied cheaply and effectively by some method which does not involve the addition of oxygen to the reactants. One way of achieving this is already foreseen. The reaction under pressure between hydrogen and oil or coal with the production of methane is rapid and highly efficient thermally. It also provides carbon in gaseous form as methane without the addition of oxygen to the system. The carbon, in the form of methane, can be brought into reaction with water vapour, so acting in its customary role as an oxygen acceptor producing additional hydrogen for the hydrogasification reaction and in due course being rejected, along with its combined oxygen, as carbon dioxide.

Use of Nuclear Reactors

This reaction between methane and steam is, of course, highly endothermic, but the heat required for the endothermic reaction may be applied externally. Initially this will be done by surrounding the reaction vessel or tubes with a pressure combustion chamber. But how convenient it will be when progress is made in the design of nuclear reactors to enable them to work at the higher temperatures which efficient power station operation demands and when these can provide a cheap source of high temperature heat.

It is important to remember that the nuclear reactor is a source of heat, and while that heat may be used to provide mechanical energy for distribution through the electrical medium, there is no fundamental reason why that heat should not be absorbed by endothermic chemical reactions and thus converted by the more efficient path into a readily distributable form. The potential efficiency of gas production by some possible paths is illustrated by a few examples:—

In the first example oil is subjected to pressure hydrogasification, which proceeds essentially according to the reaction

$$2CH_2 + 2H_2 \leftarrow 2CH_4$$

One of the two volumes of methane goes into the product gas, the other reacts endothermally with steam essentially according to the reaction

$$CH_4 + 2H_2O \rightarrow CO_2 + 4H_2$$

Two of the four volumes of hydrogen are mixed with the methane from the first reaction to yield the final product gas, and the other two volumes are recycled to the hydrogasification process. If the heat for the second reaction were supplied by the combustion of oil, 100 heat units in the oil for gasification and heating would yield 80 heat units in gas. But if 20 units of nuclear heat were supplied for this purpose and 100 heat units of oil were gasified, the gas yield would be 117 heat units, which represents a very efficient use of both oil and nuclear heat.

This particular example requires that the nuclear heat should be available at a temperature of about 1,000°C. and for this we must wait a while. But nuclear heat at current temperature levels could be used in association with known methods of coal gasification, as is assumed in the second example. The Lurgi pressure gasification process, when gasifying coal containing 100 heat units, yields 92 heat units in gas and liquid products, but to operate the process consumes a further 26 heat units for the production of steam and power. The net result is that 100 heat units in the total coal used would yield 72.5 units of heat. By obtaining the heat for steam and power from a nuclear reactor, 100 heat units in coal would yield 92 heat units in gas and liquid products. A similar result would be obtainable from a two-stage gasification process for fine coal now in course of development.

Future Possibilities

Such processes as these cannot yet be claimed as achievements but their possibility is not a remote one and they do serve to illustrate the versatility of the gaseous medium in its utilisation of sources, even to some extent the new source which is coming into use to supplement the older, failing sources. By such means the new, in partnership with the old, could materially extend the useful life of the old and avoid a waste that should never be condoned. Furthermore, the speedy practical realisation of the developments already in hand and of those projected for future research may well enable the public energy service to avoid the unnecessary expenditure of many thousands of millions of pounds of hard earned capital, sorely needed for providing for human welfare in other directions.

The economic advantages of the gaseous medium as a means of transmission, storage and distribution of energy, combined with the high conversion efficiency obtainable in gasification processes, indicate the continuing value of this means of rendering available fuel in convenient form.

Cathodic Protection

PUBLISHED by the Joint Committee for the Co-ordination of the Cathodic Protection of Buried Structures is a pamphlet entitled 'Cathodic Protection of Buried Structures.' Its purpose is to draw attention to the work of the Committee, and it describes the genesis and aims of that body, and records the progress made so far. The Committee is composed of representatives of the operators of all the major underground services in Britain, and it collaborates with the Department of Scientific and Industrial Research and several national research associations. The text is not intended to serve as a source of technical instruction in the application of cathodic protection, and the information given about practical methods has been included to illustrate matters of principle only.

COMPANY MEETING

B.H.D. Engineers Limited

TURNOVER AND PROFITS WELL MAINTAINED

COMBATING COMPETITION BY INCREASING EFFICIENCY

MR. F. BRIAN HOLMES ON ENCOURAGING CURRENT TREND

THE tenth annual general meeting of B.H.D. Engineers, Limited, was held on September 10 at 10, Belgrave Square, London, S.W.1, Mr. F. Brian Holmes, M.INST.GAS.E. (the chairman) presiding.

The following is his report which has been circulated to shareholders:

The Profit on trading for the year as shown in the accounts amounts to £621,937, showing little change from the figure of the previous year, £622,412. Depreciation at £127,911 shows an increase of £17,250 as a result of the enlargement of manufacturing space for the Holset Engineering Co. and the installation of additional plant foreshadowed in my speech last year. It will be noted that the sum of £6,219 has been written off Patent Rights.

The Profit before tax amounts to £449,449 as against £472,146 in 1957. Taxation absorbs £254,498 as against £267,957, and after making adjustment for the interest of minority shareholders at £6,903, the Profit after tax is £188,048 compared with £197,598 in the preceding year.

Your Directors recommend a final ordinary dividend of 12½% making, with the Interim Dividend of 5% already paid, a total distribution of 17½% for the year, the same as last year.

The sum of £100,383 has been transferred to General Reserve in the accounts of Subsidiary Companies and a balance of £175,439 is carried forward to next year.

Balance Sheet Features

Turning to the Consolidated Balance Sheet, you will note that the Shareholders' interest, namely Share Capital and Reserves, has increased by £151,183 to £1,825,833. Among Current Liabilities, Bank overdrafts show a slight increase at £536,787, but this is more than offset by the increase in Cash at Bank and in Hand shown under Current Assets. A new item, Patent Rights, appears on the Asset side of the Balance Sheet at £35,000 after deducting the amount written-off during the year. It is intended to write off the balance of this sum over a period not exceeding 7 years.

In the Balance Sheet of the holding company, B.H.D. Engineers, Ltd., the only items calling for special comment are the changes in the amounts of shares in Subsidiary Companies (increased to £480,211) and in advances to Subsidiary Companies (reduced to £153,473). These alterations arise from the fact that the Issued Share Capital of one of the Subsidiary Companies was increased by £99,000 during the year which reduces correspondingly the indebtedness of the company in question to the holding company.

Extension of Production Facilities Completed

As I have indicated above, the extension of the Holset Engineering Company's production facilities has been completed, Prototypes of The Schwitzer Turbo-charger and non-bonded rubber Damper have been fully tested and as a result of the encouraging reception accorded these two new interesting lines of equipment by a number of engine builders we hope to be in quantity production before the end of the year.

I have in recent years found it necessary regularly to refer to the difficulty of obtaining our requirements of steel plate. I am glad to be able to report that there has, at last, been an improvement in the supply position which makes it no longer necessary for us to purchase continental plate at enhanced prices. I only hope the supply situation will not deteriorate again.

In order successfully to meet increasing competition and the tendency towards lower profit margins, your Directors are paying particular attention to the attainment of the highest degree of operating efficiency in each of the units in the Group. To assist them they are employing the services of a well-known firm of Management and Works Consultants with, so far, very satisfactory results.

Research and Development continue at high level and cover both the improvements of existing processes and plant and the investigation of new projects by which we may further widen the Group's interests.

Trading Conditions

The steps taken by the Government to halt inflation, including the postponement of Capital Expenditure by the nationalised industries, have naturally affected the Group. As a result, the value of orders received in the year under review was below that of the preceding year, but fortunately turnover was maintained due to the carry-over of work in hand from previous years. While in some respects this reduction in the back-log of orders is an advantage in that it permits better deliveries to be given which in turn has an important bearing on new business, had this continued much further it would have been a cause for serious anxiety. I am glad, however, to be able to report a more encouraging trend at the moment as a result of which the value of orders received to date this year is considerably in excess of that of the corresponding period in 1957.

Your Board is of the opinion that unless circumstances arise which are beyond our control and which affect our business adversely, the current year's results should compare favourably with those of the year covered by this Report.

Directors' Fees

It is becoming increasingly necessary for all your Directors to devote more of their time to the affairs of your Company and since there has been no change in the Directors' fees since the company was incorporated on January 19, 1949, it is now considered justifiable to ask the Shareholders to sanction an increase of fees for each Director from £200 per annum to £500 with an additional £500 per annum for the Chairman as set out in the Notice of the Extraordinary General Meeting to be held at the conclusion of the Annual General Meeting.

In conclusion I would like to pay sincere tribute to my colleagues on the Board, to the Executives of the various companies in the Group, to all our staff and employees for their help, efforts and loyalty which made such a vital contribution to the year's results.

The report and accounts were adopted and the dividend recommendation was approved.

The retiring directors, Mr. G. F. Chambers, M.A., and Mr. C. Cooper, M.SC., M.I.CHEM.E., M.INST.GAS E., having been re-elected the proceedings terminated.

At the subsequent extraordinary general meeting the proposed increase in Directors' Fees was sanctioned.

Sc.G.B. Approves £287,000 Projects

PROJECTS totalling £287,790 have been approved by the Scottish Gas Board during the past three months, it was reported at a recent meeting of the Scottish Gas Consultative Council in Edinburgh.

The biggest individual item is the Glasgow and Western Division's provision of £118,000 for the extension of a high pressure steel grid main from Cumbernauld to Coatbridge. This main will enable increased quantities of gas from the Lurgi plant at Westfield to be transmitted to Provan without the need for recompression at Coatbridge, thus resulting in a saving in running costs.

£600,000 Loan

The South Australian Gas Company is offering bonds bearing interest at £5 10s.% in respect of a £600,000 loan required to finance capital works associated with the expansion of the Company's undertakings.

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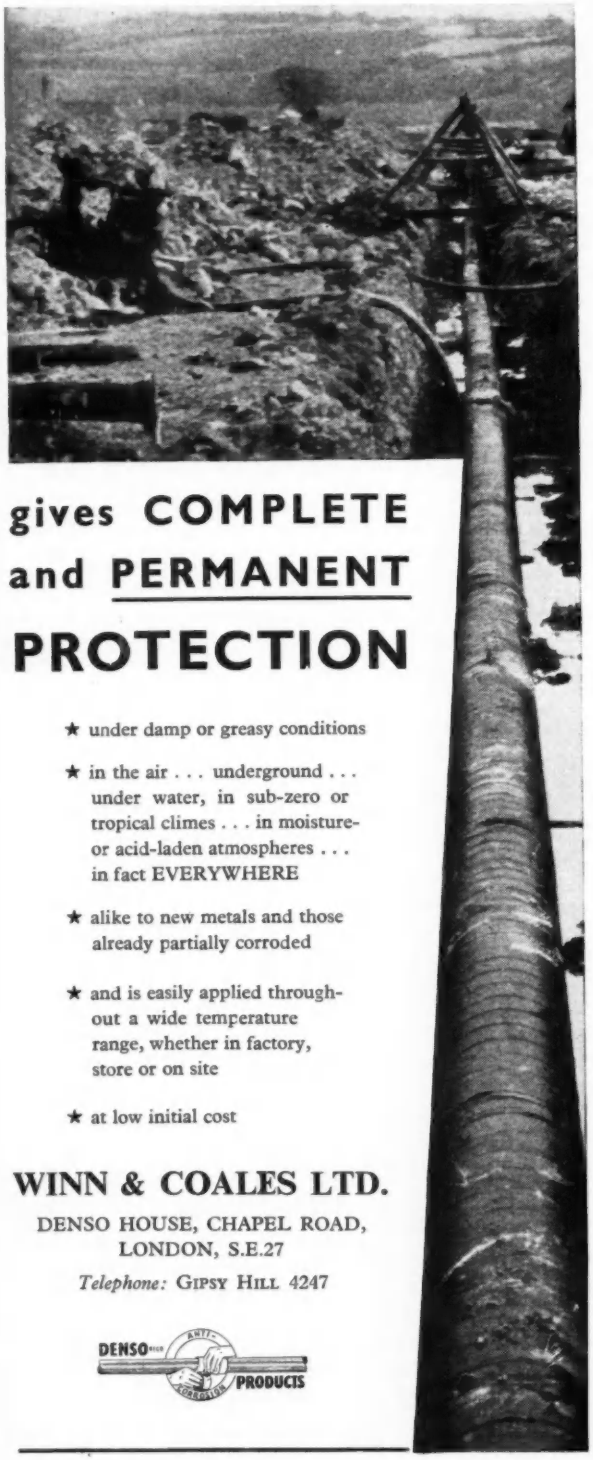

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